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THE
PHILADELPHIA
ELECTRICAL
HAND
BOOK

MEMORANDUM.

This electrical handbook is one of a series of ten similar handbooks prepared under the auspices of the AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS by the local Reception Committees in the Cities of Boston, New York, Schenectady, Montreal, Niagara Falls, Chicago, St. Louis, Pittsburg, Washington, and Philadelphia. These are the stopping places on the circular tour organized by the INSTITUTE for the reception and entertainment of its foreign guests who visit the United States in connection with the International Electrical Congress at St. Louis, September 12th to 17th, 1904. It is hoped in these handbooks to present short historical sketches of the cities visited and a rapid survey of the power plants and important electrical industries along the route.

Philadelphia.

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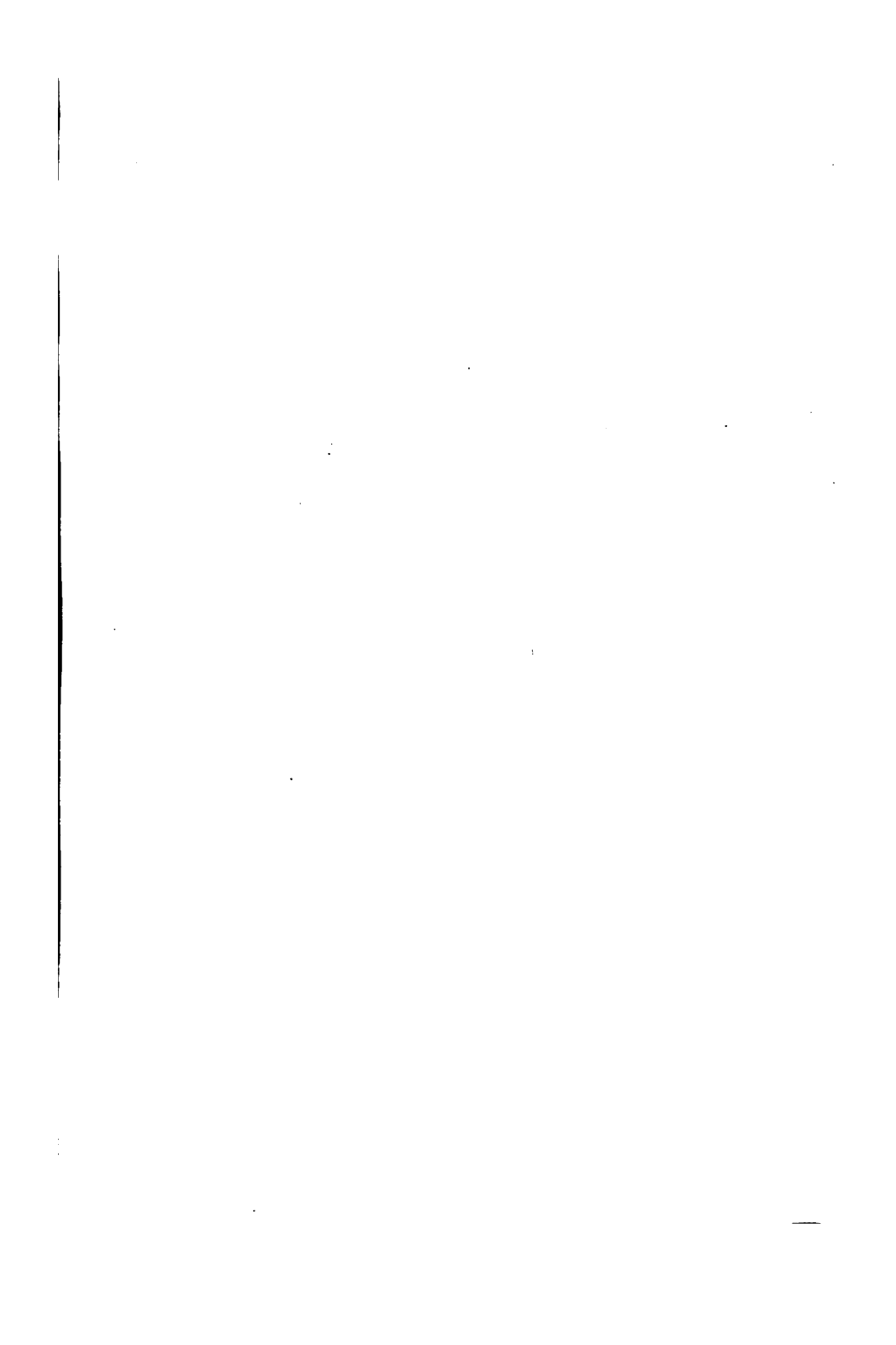
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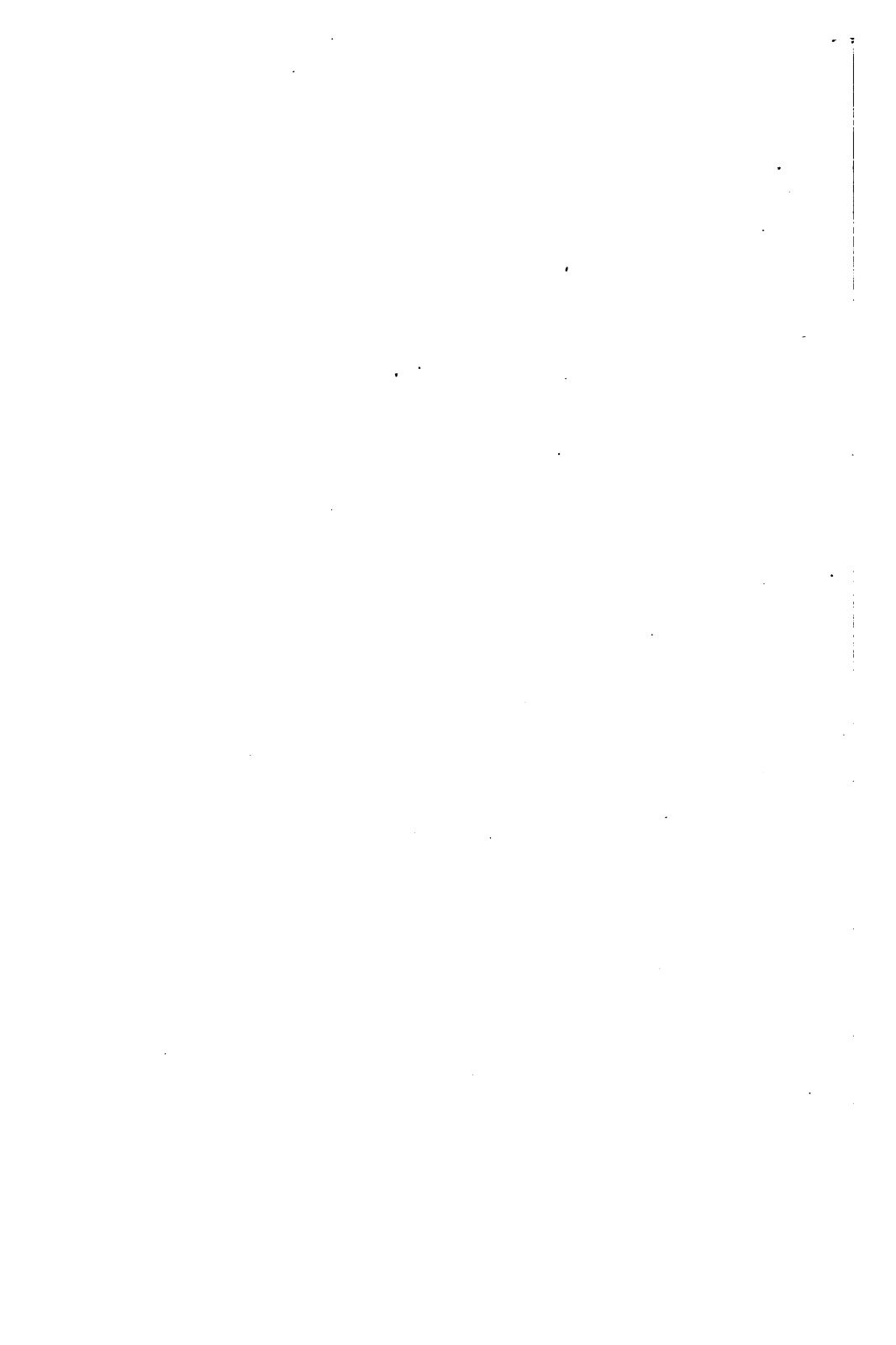
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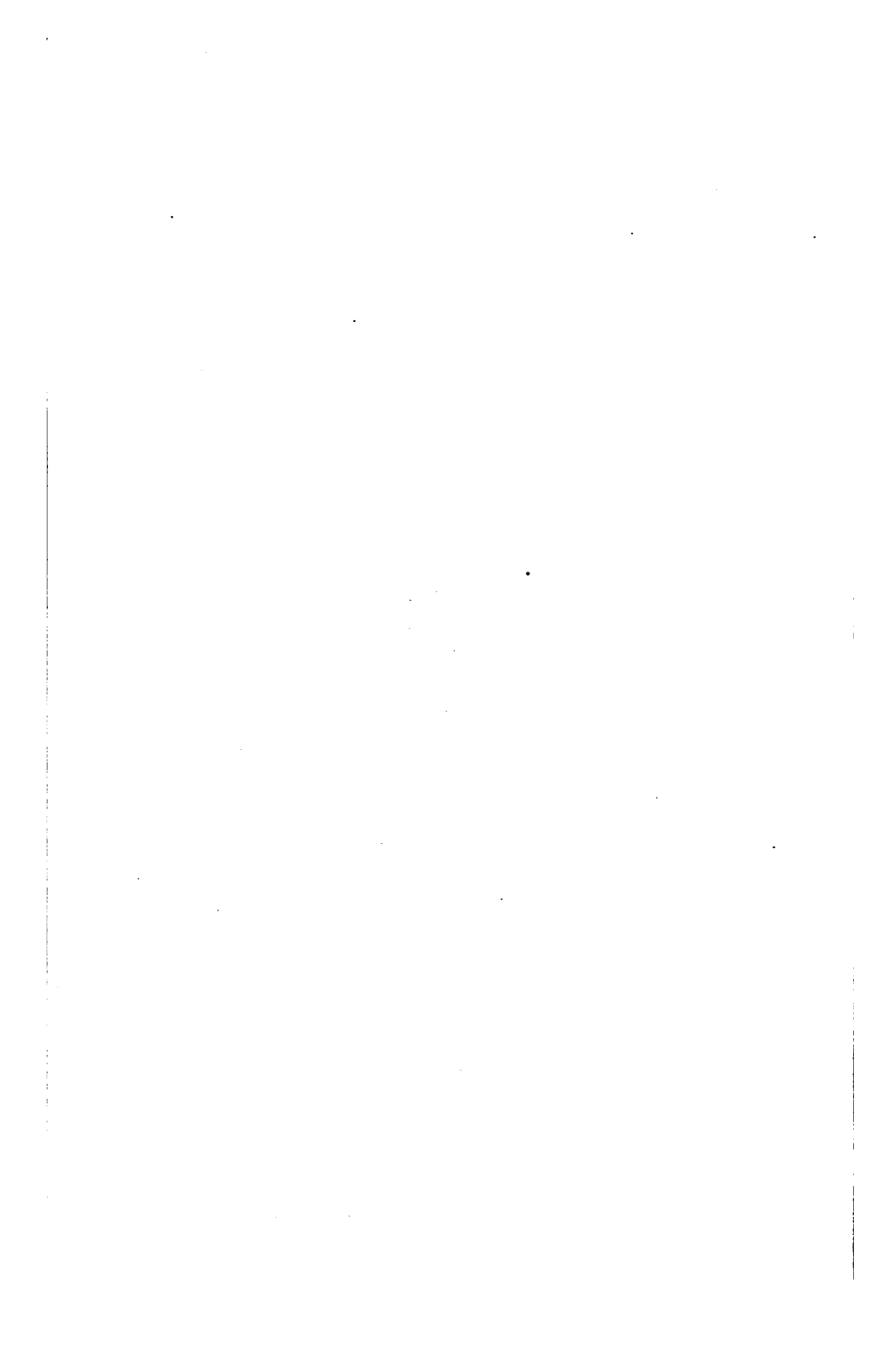
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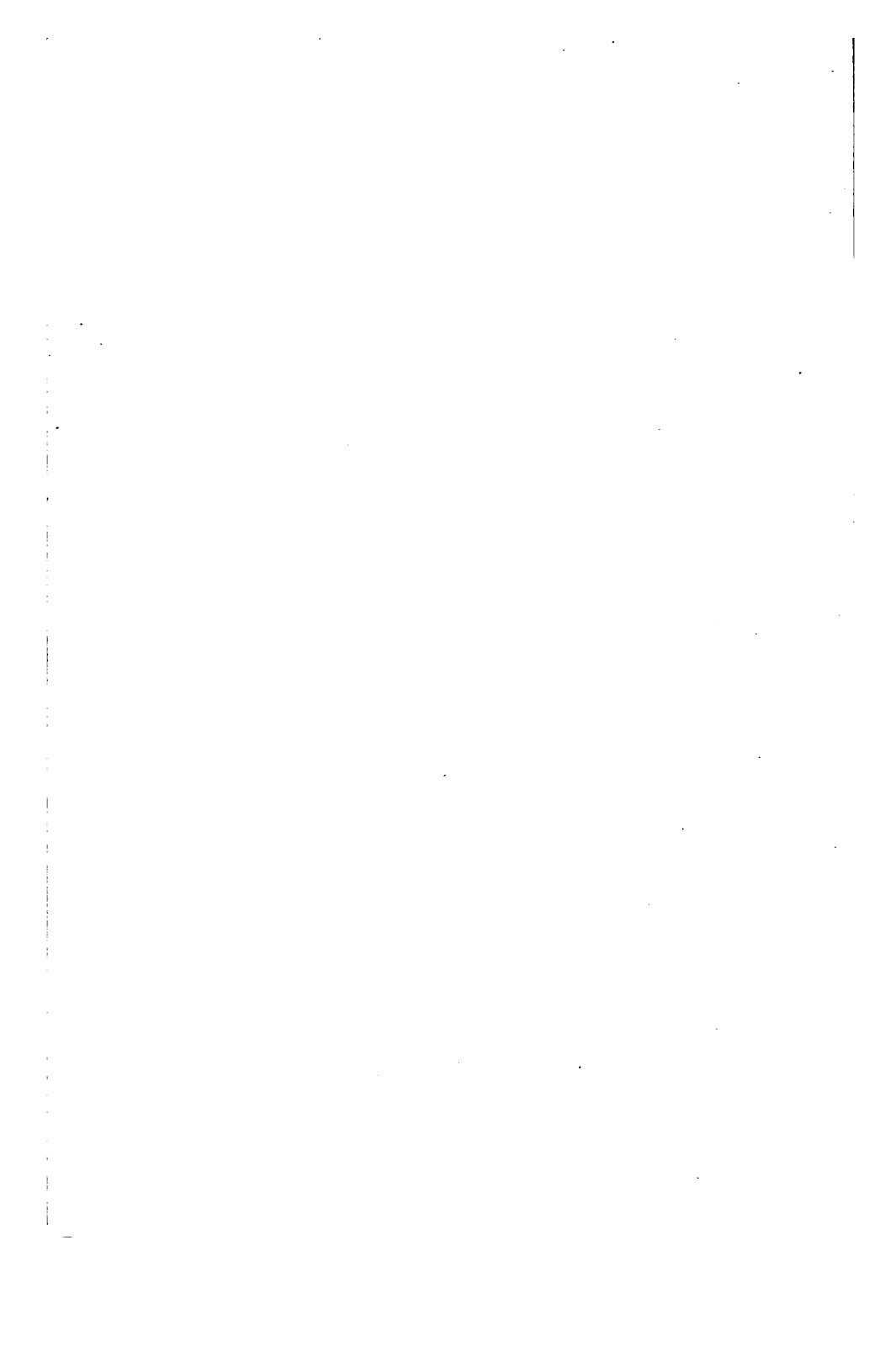








***THE PHILADELPHIA
ELECTRICAL HAND-BOOK***



THE PHILADELPHIA ELECTRICAL HANDBOOK

*A SKETCH OF THE CITY AND SOME OF ITS GREAT
ENTERPRISES FOR THE INFORMATION OF
VISITORS FROM ABROAD ATTENDING THE
INTERNATIONAL ELECTRICAL CONGRESS, SAINT
LOUIS, MISSOURI, SEPTEMBER 1904.*



Philadelphia

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THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS



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Statue of William Penn
Crowning the City Hall Tower, Philadelphia

NAMES OF STREETS RUNNING EAST AND WEST, WITH NOS. OF HOUSES

NORTH OF MARKET STREET

House No.	Name of Street	House No.	Name of Street
I	Market	1400	Master
100	Arch	1500	Jefferson
200	Race	1600	Oxford
300	Vine	1700	Columbia Avenue
400	Callowhill	1800	Montgomery Ave.
438	Noble	1900	Berks
500	Buttonwood	2000	Norris
520	Spring Garden	2100	Diamond
600	Green	2200	Susquehanna Ave.
700	Fairmount Avenue	2300	Dauphin
800	Brown	2400	York
836	Parrish	2500	Cumberland
900	Poplar	2600	Huntingdon
1200	Girard Avenue	2700	Lehigh Avenue
1300	Thompson	2800	Somerset

SOUTH OF MARKET STREET

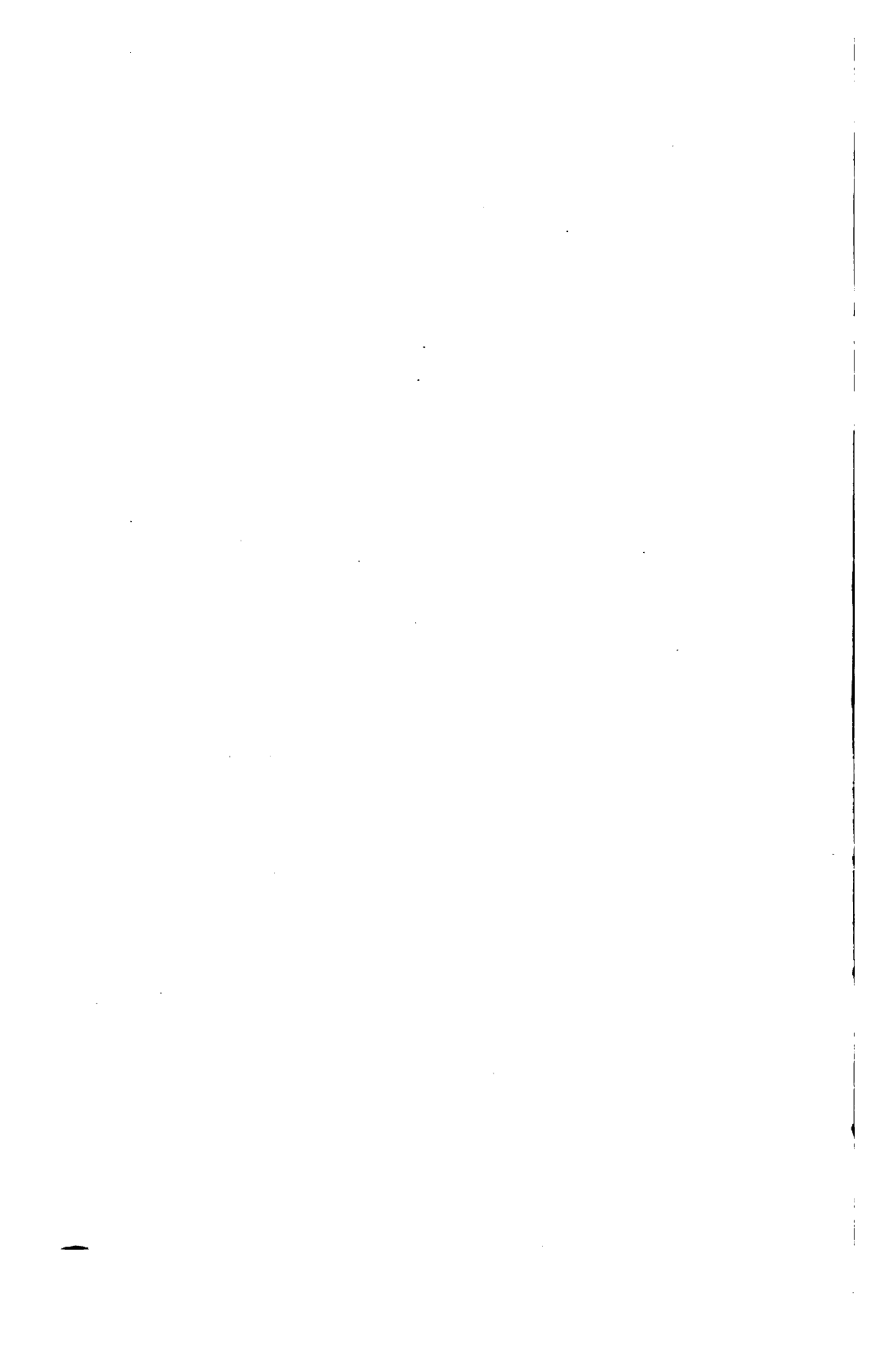
House No.	Name of Street	House No.	Name of Street
I	Market	1400	Reed
100	Chestnut	1500	Dickinson
200	Walnut	1600	Tasker
300	Spruce	1700	Morris
400	Pine	1800	Moore
500	Lombard	1900	Mifflin
600	South	2000	McKean
700	Bainbridge	2100	Snyder Avenue
740	Fitzwater	2200	Jackson
800	Catharine	2300	Wolf
900	Christian	2400	Ritner
1000	Carpenter	2500	Porter
1100	Washington Avenue	2600	Shunk
1200	Federal	2700	Oregon Avenue
1300	Wharton	2800	Johnson

INTERNATIONAL ELECTRICAL CONGRESS
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*PHILADELPHIA—GENERAL
FACTS*





PHILADELPHIA

General Facts

PHILADELPHIA ranks as third in population in the United States and is one of the nine greatest cities of the world. The birth of Philadelphia is generally considered to have been coincident with the arrival of the great Quaker proprietor, William Penn, who first sailed up the Delaware River in the year 1682, although for more than half a century prior to this time the Swedes had been scattered along the stream, and had maintained a settlement within the present confines of the city, at Wicaco, from the year 1677.

Through the broad-minded direction of Penn, the city was surveyed by Thomas Holme, under the immediate supervision of William Markham. Provision was made at intervals for public squares, and thus the old city was built upon the severely rectangular plan which is one of its leading characteristics. Beyond the limits of the original survey numerous country roads led away at various angles to the general plan, and these have long since been absorbed into the great system of the city highways, which now cover a space, mostly well populated, of one hundred and twenty-nine square miles.

AMPLE ROOM

The city is fourteen miles long upon its north and south axis and from the Delaware River westward through the business section it extends seven miles to the county line. No other large city contains as much space

per capita as Philadelphia, the conditions thus tending to promote cleanliness and health. The old city proper, spread between the Delaware and the Schuylkill Rivers, covers a great plain which is but a few feet above tide water in its southern extreme, but rises in the northern wards to an altitude in places of 120 feet. In West Philadelphia, now a favorite home section, the elevation is considerably greater. The highest points within the lim-



Looking North on Broad Street

its are near Chestnut Hill, where the ground rises to 400 feet.

STEADY PROGRESS

While many of the early settlements along the Atlantic seaboard have languished and failed, Philadelphia has developed steadily from the beginning. Behind her, covering forty-five thousand square miles, is the great State of Pennsylvania, the richest commonwealth in the Union, for whose vast and varied products of the field,

forest and mine this city is the natural outlet. With a broad channel connecting her roomy harbor with the open sea she has always been a large factor in the commerce of the nation, both domestic and foreign, and in this particular will soon greatly increase the ratio of her importance.

It is, however, principally as the centre of enormous manufacturing interests that Philadelphia has grown to such vast proportions, and to the creative industries by far the greater portion of her busy army of wage earners owe their remarkable prosperity and contentment.

THE REWARDS OF TOIL

Nowhere else in the world can the toiler obtain more constant employment or surround his family with more security and comfort through the fruits of labor than in this city. In no great community elsewhere are the conditions of life among the middle classes so favorable to the enjoyment of life or the best development of good, honest, efficient character.

PHILADELPHIA STATISTICS BASED UPON THE NATIONAL CENSUS FIGURES FOR 1900, RELATING TO MANUFACTURES

Total number of establishments.....	15,887
Capital employed.....	\$953,097,424
Wage earners.....	246,445
Value of annual product.....	\$603,466,526

Compared with the entire State of Pennsylvania, Philadelphia contains thirty per cent. of all establishments, employs thirty per cent. of total capital, pays thirty per cent. of wages earned, employs thirty-three per cent. of the workers, and produces nearly thirty-three per cent. of the annual gross output of manufactures of all kinds.

Of wage earners seventy per cent. are men earning a weekly average of \$10.25, twenty-five per cent. are women earning a weekly average of \$5.65, and five per cent. are children earning a weekly average of \$3.27.

There are eighty-seven lines of manufacturing industry in Philadelphia which have an annual product of above \$1,000,000 each, thirty lines producing above \$5,000,000 each, and fourteen lines each producing above \$10,000,000 annually. The last named aggregates about forty-two per cent. of the total local product. Philadelphia ship yards are second only to those of the Clyde,



The Schuylkill River

Scotland. This city is first in the production of locomotives and saws; first in the manufacture of carpets and rugs, of which goods about half of the entire product of the country are made here. More ingrain carpets are woven in this city than anywhere else in the world. This city ranks second in America in woolen goods, and third in worsted goods.

During the decade preceding 1900 Philadelphia capital invested in manufactures increased twenty-seven per cent. Production increased 4.5 per cent.

POPULATION AND OWNERSHIP

The population of Philadelphia now exceeds one million four hundred thousand.

These citizens reside principally in separate and distinct homes, of which there are more than two hundred and seventy thousand. While the rental system is extensive and advantageous, the occupants of the houses are largely owners. This class numbers about 60,000. This desirable condition amounts here to almost the condition of a mania. Homes are largely paid for through the well-known system of building associations, of which there are some six hundred in the city. Ninety-three per cent. of the people live in private houses.

Five thousand new homes are built for 25,000 added people every year.

The impress of Quaker simplicity will always be seen in the earlier architecture of the city, but the old red and white fronts, glaring in the sunlight, are now largely relieved by more ornate and tasteful designs in not only home building but in a great number of splendid public, corporate, educational, office and other modern structures which now grace our streets.

In the past eight years the great sum of \$201,700,000 has been expended in the city upon buildings largely for business purposes, although eighty-seven per cent. of the amount went into new dwellings.

TAXES AND IMPROVEMENTS

The taxable valuation of the real estate in Philadelphia is nearly \$1,200,000,000. The funded debt is less than five per cent. of this amount and below the value of the public property. Taxes are now \$1.50 per \$100.00. Under a special loan of \$16,000,000 the city is now engaged in completing the largest filtration plant in the world, building numerous new school houses, hospitals and bridges, projecting extensive boulevards, park enlargements, and the correction of grade crossings along the urban steam railroad trackage.

OUR HIGHWAYS

Within recent years the development of a great network of electric railway lines, extending far into the open country in all directions, has fostered the growth of beautiful new residential sections within easy reach of the city's centre. Along with the completion of modern local passenger service has come the very general repaving of the streets, chiefly with asphalt, and nowhere are the cyclists, auto enthusiasts and drivers more favored with good surfaces than here. Broad Street, extending from north to south through the centre of the city, is the longest paved street in the world.

Philadelphia has about 1,200 miles of paved streets and in addition some 462 miles of suburban roads, generally well telforded. The paved surface would make a continuous avenue thirty feet wide from the city to the Mississippi River. The character of the paving is as follows: 368 miles of granite blocks, 338 miles of sheet asphalt, 263 miles of macadam, 142 miles of vitrified brick, 41 miles of granolithic and slag, 73 miles of cobble. Beneath these streets are 900 miles of sewers. The streets and 318 city bridges are lighted by over 10,000 electric arc lights and 33,409 gas and gasoline lamps. Water is conveyed through 1,420 miles of pipe to 242,506 buildings. Conduits for electric wires measure 800 miles and there are 18,189 miles of electric wires upon 61,981 poles.

LOCAL CHARACTERISTICS

It is current fiction, fondly cherished in scores of less prosperous or well ordered cities, that Philadelphia is "slow." In this matter, which largely arises from a certain conservatism born of a sense of her own greatness, Philadelphia is often giped by the newspapers of towns, all over the western country, which exist by virtue of Philadelphia investment and could only keep their places upon the map through grace of continued Philadelphia help.

Recent statistics have shown that this city produces

about one-twelfth of all the manufactured goods made in this country.

Here are located the great ship-building plants which send forth upon the sea not only the largest of the ships of trade, but many of the invincible vessels of our new navy, and to which Russia, Japan and other distant coun-



William Penn's House, Fairmount Park

tries have turned for their ships of war. Here are made the locomotives for railways all over the world, not excepting England, and to this city even the British in Egypt look for iron bridges.

The costly improvements along the Delaware River water-front will, with the large dredging operations down the river, soon place this port among the foremost upon this coast.

The system of retail shopping has been developed here

by several great firms beyond that found even in the cities of New York or Chicago.

We lead in the study of medicine, dentistry and the applied arts.

OUTING FACILITIES

Several railroads extend across New Jersey to the seashore and carry the people of Philadelphia in one brief comfortable hour away from the swelter of town down to the modern sea-side city of Atlantic, Ocean City, Wildwood and many other charming sea-side places.

Other interesting excursions may be made to many pleasant spots up or down the Delaware River, or by electric and steam cars to Willow Grove Park, Woodside and similar charming refuges from the summer heat.

FAIRMOUNT PARK

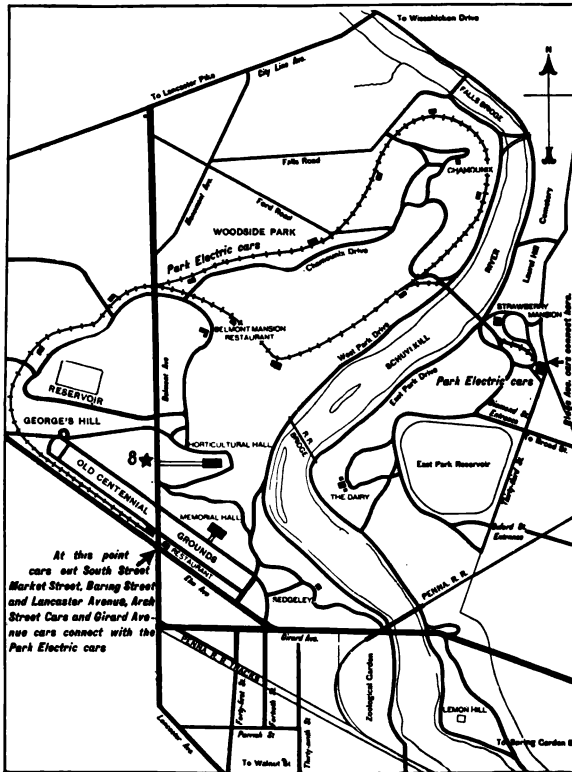
Fairmount Park, where the great Centennial Exposition arose a generation since, is the queen of all public domains both in extent and natural beauty. It contains the splendid museum of Memorial Hall, the picturesque Horticultural Building, a wealth of historic colonial structures, and through the efforts of the Fairmount Park Art Association a rich array of patriotic and historic bronzes.

Fairmount Park is the largest public park in the world; it embraces 3,750 acres, with natural scenery unsurpassed. Among the most prominent parks in the world may be mentioned the Bois de Boulogne, Paris, 2,158 acres; the Prater, Vienna, 2,500 acres; Windsor Great Park, London, 1,800 acres; Richmond Hill, London, 2,468 acres; Phoenix Park, Dublin, 1,752 acres; Hampton Court, near London, 1,872 acres; Petit Park, Versailles, 1,280 acres. These are the only parks out of many hundreds whose extent exceeds 1,000 acres.

The park in its present dimensions was a work of time, and of much labor and thought upon the part of the public-spirited citizens of Philadelphia.

Within what is termed the East Park, commencing at

Callowhill street bridge, are first the old water works. At Green street entrance is seen the splendid Washington Monument of the Society of the Cincinnati. But a short distance, in sight, is the Lincoln Monument, Foun-



Fairmount Park

tains, Garden and Mineral Springs. Numerous boat-houses of exceeding beauty line the river bank at this point. This is the American Henley. Lemon Hill Mansion, on an eminence overlooking the city, is a pleasant place to rest. The music pavilion is near the mansion.

From this point to Girard avenue bridge are to be seen many objects of interest—among them the cottage which General Grant occupied at the siege of Richmond. At Girard avenue the footpath and the main drive unite. There is a fine river road commencing at Lincoln Monument, passing the boat-houses, the "Tam O'Shanter" group of statuary, beneath overhanging rocks and vines, extending under bridges and through tunnels to the Wis-



East River Drive, Fairmount Park

sahickon. The Garfield Memorial and new equestrian Grant Monument are upon this drive. Another drive extends along the west shore of the river, and upon the heights beyond Belmont is the new "Speedway."

The Park statuary includes figures of Charles Carroll, of Carrollton; Commodore Barry, of the Revolutionary Navy, and Dr. Witherspoon. There are also statues of Washington, Grant, Garfield, Humboldt, Abraham Lincoln and General George Gordon Meade, Morton McMichael, Goethe and Schiller, a statue of Religious Liberty, and a statue of Columbus which is believed to be the first erected in any part of the United States. The

beautiful equestrian statue of Jeanne d'Arc stands at the eastern approach to Girard avenue bridge. The Richard Smith memorial arch, costing \$500,000, is in course of completion in the West Park. The cost of the grounds



On the Wissahickon Stream, Fairmount Park

and subsequent improvements have been about ten millions of dollars. An electric railway traverses the West Park, connecting with the east side at Strawberry Mansion. Philadelphia has in addition some thirty lesser parks and squares. Music of a high order is furnished at alternate places in Fairmount Park every week day by

a fine band and upon Sundays at Lemon Hill. The municipal band gives daily concerts in the smaller parks and squares during the summer.

THE ZOO GARDEN

Close by the Park is the interesting Zoological Garden, with its costly collection of living animals, and at the



Statue of Gen. Geo. G. Meade, Fairmount Park

furthest extreme of the Park is the peerless drive and stream of the Wissahickon.

BROTHERLY LOVE

Philadelphia does not throw into the scale of inducement to the stranger within her gates those lurid attractions which appeal to the grosser passions, but extends to him, when he comes here, that welcome which has won for her the honorable title of the "City of Brotherly Love." Such a city, indeed, as William Penn, standing beneath the historic elm of Kensington, saw with the eye of the prophet and made provision for in all his plans.

THE CITY HALL

The great central feature of the city is its City Hall, or "Public buildings." The work upon this structure was commenced in 1871, and has cost to the present time about \$24,000,000.

The length of the north and south fronts is 470 feet, and that of the east and west fronts is $486\frac{1}{2}$ feet. The material principally used for both the building and enormous tower is white marble from quarries at Lee, Berkshire County, Mass. The interior windows of its six floors of busy public offices look out upon a courtyard 200 feet square, the favorite "short-cut" of many busy thousands every day. A full division of infantry troops might be comfortably massed within this enclosure.

Four grand archways, eighteen feet wide and thirty-six feet high, richly embellished with polished columns and beautiful sculpture, are the sluiceways for the ceaseless human tide that surges through this splendid plaza.

Philadelphia of to-day is quite willing that this majestic building, and especially its tower, shall stand before the people of generations yet to come as the symbol of civilization and taste obtaining among us at the beginning of the present century. The tower is the great peculiar feature of the entire structure, and no person who has once enjoyed the far-reaching and impressive bird's-eye view of this bee-hive of humanity will regret the millions it has cost to rear this purely ornamental shaft. The tower is ninety feet square at the base, and its walls are twenty-three feet thick. The entire height of the work to the broad-brimmed hat upon the head of William Penn is 547 feet and a fraction, an elevation greater, it is said, than any steeple or structure in the world built in connection with an edifice. It exceeds that of the Great Pyramid sixty-seven feet; St. Peter's Church, Rome, ninety-nine feet; the Cologne Cathedral, thirty-seven feet. It is nearly twice the height of the dome of the National Capitol. The Washington Monument exceeds its altitude by eight feet only. A great clock, the plates of which have a diameter of twenty-three feet,



The City Hall

adorns the tower at an elevation which makes it visible from all parts of the city, the centre dial being 361 feet above the sidewalk. The metallic columns and dome, of which the upper section consists, are plated with aluminum.

The magnificent bronze figure of William Penn, the work of Philadelphia mechanics, is thirty-seven feet high and weighs 52,400 pounds. It was cast in forty-seven pieces, and so skilfully joined that the most careful inspection fails to detect the junctures.

Public elevators are operated, connecting with all floors, and another rises to the top of the great tower. The remarkable hanging stair-ways at the four angles of the building are worthy of special notice by the visitor. Guides are always in attendance at the City Hall to show visitors through its apartments. For this service there is no charge, but fees are accepted when tendered.

INDEPENDENCE HALL—THE CRADLE OF LIBERTY

Independence Hall, the Mecca of American freemen, was built by the Colonial Assembly in the years 1732 to 1741. Though it was occupied in 1735, it was not considered completed till 1741, and even then neither tower nor steeple crowned it.

Here it was that the Declaration of Independence was considered and adopted and from its portals it was proclaimed, and it is worth remembrance that a Tory lady wrote in her diary: "The Declaration was read to-day. Very few respectable persons were present." At this spot Washington read his farewell address to the American people. Here the Articles of Confederation were adopted, and the Constitution of the United States was framed.

Within recent years the restoration of Independence Hall, which had been in progress for a considerable time, was completed, and it presents to the visitor the exact condition in which it stood at the period of the Revolutionary War. In addition to the Hall of Congress and

the Supreme Court Room upon the first floor, a very interesting Colonial Museum is to be seen in the flanking buildings and portraits upon the second floor. In the museum may be seen a number of Franklin's original electric devices and his famous lightning rod.

The buildings east and west from Independence Hall proper, located respectively at the corners of Sixth and Chestnut Streets (Congress Hall) and Fifth and Chest-



Independence Hall

nut Streets (Common Hall), are scarcely less interesting than the immediate "Cradle of Liberty."

Congress met in Congress Hall from 1790 to 1800 and there the Constitution was put in running order.

The second inauguration of Washington was held in the same building March 4, 1793.

John Adams was inaugurated second President in Congress Hall, March 4, 1797, and there he presided over the Senate.

The official announcement of Washington's death was made to both Houses of Congress in the same place.

In Common Hall, at Fifth and Chestnut Streets, the Supreme Court of the United States sat from February, 1791, to August 5, 1800. The Supreme Court of Pennsylvania also met there.

THE PHILOSOPHICAL SOCIETY

Adjoining this building to the south is the venerable structure largely occupied by the Philosophical Society,



Liberty Bell

which was founded by Benjamin Franklin in 1743. Upon the roll of membership, from the earliest day to the present time, may be found some of the greatest men in our country's history, all banded together for the promotion of useful knowledge. The present building was commenced in 1785, but was not entirely finished until the year 1791. It is an interesting fact that the building contained the University of Pennsylvania for five years, from 1789 to 1794. Many memories cluster around this old colonial structure,—memories of Franklin, Washington, Jefferson, Rittenhouse, Bishop White, Rev. Nicholas

Colin, and many others who are closely identified with our early history and scientific development.

A few years ago an additional story was put on the building, and the structure made fire-proof throughout. The additional room now contains the valuable library of the Society, including over 50,000 volumes and manuscripts, the second floor being used exclusively for



Where Independence was born

meeting purposes. The American Philosophical Society has always been a strictly American institution, representing Philadelphia of days gone by, and as such is well worthy of a visit from intelligent strangers, be they from this country or abroad. The rooms are open weekdays between 10 a. m. and 1 p. m.

Independence Square is one of the attractive spots in the heart of the city and is especially noted for its beautiful trees, many of which were planted in the early days of the city's history. Four similar squares in the heart of the city are Washington, Franklin, Logan and Ritten-

house. The last two named are still surrounded by fine residences of old Philadelphia families.

CARPENTERS' HALL

Another edifice, almost as hallowed a relic of Revolutionary days as Independence Hall, is "Carpenters' Hall,"



Carpenters' Hall

which stands to the south of Chestnut Street, between Third and Fourth Streets, and is reached by a passageway from the street first named. It was here where, as by inscription on the walls, the visitor is told, "Henry,

Hancock and Adams inspired the delegates of the colonies with nerve and sinew for the toils of war;" where the first Continental Congress assembled, and where the first prayer in Congress was offered up by the rector of Christ Church, Mr. Duche, on the morning after the false report had been received of the bombardment and destruction of Boston. The first Provincial Assembly also held its sittings here; it was occupied by the British troops and next by the United States Bank and the Bank of Pennsylvania in succession. The hall was built in 1770 as a meeting place for the house carpenters of Philadelphia.

THE OLD FLAG HOUSE

This quaint little structure, wherein the first American flag was made by Betsy Ross, is located at 239 Arch Street. An association is now engaged in the laudable effort to raise funds for its purchase and preservation.

THE GRAVE OF FRANKLIN

In the old cemetery at Fifth and Arch Streets is seen the grave of that sturdy American, Benjamin Franklin, one of the most remarkable characters in the history of this country.

FRANKLIN INSTITUTE

Franklin Institute, the mother of countless inventions, founded in 1824, occupies its time honored building upon Seventh Street above Chestnut. The membership roll contains over 2,000 names. The splendid library of reference is of an exclusively technical and scientific character. Lectures are a feature in the winter season.

THE BUILDERS' EXCHANGE

The Builders' Exchange upon Seventh Street above Chestnut has been in existence fifteen years. The Builders' Exchange Mechanical Trade Schools have for their object the instruction of young men whereby they will be

given such insight into whatever building trade they may select, as will enable them to be at once useful and remunerative to their employers when they enter upon a regular apprenticeship, and tend to save them from the drudgery to which the average American boy so strongly



Old Flag House, 229 Arch Street

objects, but which the ordinary apprentice is subjected to during the first year or so of his efforts to become a skilled mechanic. Instruction is given in the use of tools, the actual handling, mixing and manipulation of materials, and also in mechanical drawing, and other technical points which will prove useful in the trade.

These schools have been in operation since September, 1890, and are the first of the kind ever established under the auspices and control of a builders' exchange. Their success is very gratifying, and efforts are now being made by the Exchange toward their permanent endowment and material enlargement from year to year. The Builders' Exchange Permanent Exhibition has become



Old Swedes' Church

so well known that visitors to Philadelphia desirous of seeing the special attractions, are shown through it the same as through Independence Hall, Girard College, the United States Mint, the City Hall, or Fairmount Park. It constitutes a handsomely arranged and classified exhibit of all kinds of materials and devices which enter into the construction and finish of buildings, and occupies the entire first floor of the Exchange.

HISTORIC CHURCHES

The old Swedes Church, which stands on Swanson Street (so named from the Swedish family who once owned all the land in that part of the city), below Christian, is one of the most venerable edifices in America. The first church upon the site was erected in 1677. The present brick edifice was erected in the year 1700.

Another sacred relic of Colonial times is Christ Church, on Second Street near Market. It was begun in 1727, and was finished by the raising of the steeple in 1754. Its chimes of bells is among the oldest on this side of the Atlantic. When the British troops took Philadelphia, these bells, like others in the city, were removed to prevent them from falling into the hands of the enemy and being cast into cannon. They returned with the patriots, and have remained to peal forth their music ever since. In their time they have summoned to worship some of the greatest men the country has produced. Washington was a regular worshiper at Christ Church when President of the United States, and many of the heroes and patriots of the "times that tried men's souls" rest in its vaults.

THE MINT

The new United States Mint, located upon Spring Garden Street west of Sixteenth Street, is a noble structure much visited by strangers.

In April, 1792, an act was passed by Congress establishing the Mint of the United States and in the same year a lot was purchased in Philadelphia, on Seventh Street, below Arch. Upon this lot was erected by the Government a building which for forty years was used as the National Mint. On July 4, 1829, the corner stone for a new Mint was laid on a piece of ground on the northwest corner of Juniper and Chestnut streets. The site cost the Government a little over \$30,000, and was sold a short time ago for \$2,000,000.

The present granite building occupies the block bounded by Sixteenth, Seventeenth, Spring Garden and

Buttonwood streets, with entrance on Spring Garden Street, and was opened for business on October 15, 1901. The plan of the building is a hollow rectangle, with central courtyard, divided into two by the wing containing the numismatic room. The cost, including site, construction and equipment, was nearly \$2,500,000. The building is lighted by electricity and the machinery driven by electricity generated on the premises. Coal is used for making steam for running the engines and heating the building, but all other heating is done by gas made in the building.

Visitors are admitted free every day, except Sundays and legal holidays; the hours being: Saturdays, 9 to 11 a. m.; other days, 9 a. m. to 2 p. m. Guides are provided, who will conduct visitors, in small parties, through the visitors' gallery and explain to them and point out the processes through which the metal passes to be made into the finished coin.

The massive entrance, with its bronze doors; the vaulted lobby, with its mosaic arches, ceiling and illustrations of mint processes by Tiffany of New York, and the grand staircase, with its eagles and candelabra, are worthy the examination of visitors.

Gold is received at the Mint in a variety of forms; in bars, from assay offices, refineries and manufacturers; as nuggets, gold dust, old jewelry, old coin, etc. Silver is only purchased at present in the state of mutilated United States coin, as the large quantity of this metal bought under the Sherman act has not yet been exhausted.

There were coined at this Mint during the calendar year 1903, 1,016,813 gold pieces, valued at \$8,821,260.50; 36,102,329 silver pieces, of the value of \$10,159,724; and 113,101,218 pieces of nickel and bronze, of the value of \$2,251,281.18, of the regular United States coinage. Besides these there were struck 48,150,431 pieces for the Philippine Islands; 1,800,000 pieces for the Venezuelan Government, and 630,000 pieces for the Government of Costa Rica, making a grand total of 200,800,791 pieces coined during the year.

The engraver and his department at this Mint make



U. S. Mint, Philadelphia

all the dies for the coinage for all the mints of the United States, and nearly all the dies for medals ordered by Congress. Many thousands of medals, national and private, are made at this Mint each year. The other mints do not make medals. Machinery is built here for this and the other United States mints.

THE ACADEMY OF FINE ARTS

The Pennsylvania Academy of Fine Arts is the oldest art institution in America. It was founded in 1805 and chartered the next year. The germ from which it sprang had its existence in 1791, when Chaarles Willson Peale attempted to organize in Philadelphia a school for fine arts.

The special purpose of the school has been to afford facilities and instruction of the highest order to students who intend to make painting or sculpture their profession. No advantages but those of pure art education are offered; work comprising study in black and white from the antique casts; lectures in perspective, composition and anatomy, combined with practical work in each of the subjects; color study from still life; elementary modeling from the cast; and study from living models, nude and draped, in black and white, in color, and in clay modeling.

The instruction is of the most advanced character, and is conducted by means of lectures. The galleries of the Academy are open free to visitors.

About \$18,000 was devoted this year to traveling scholarships.

Art education is also afforded at the School of Industrial Art, the Drexel Institute, the Spring Garden Institute and at a number of private schools.

GIRARD COLLEGE

Stephen Girard was born in Bordeaux, France, May 20, 1750. He began life for himself by going to sea as a cabin-boy and part owner of a sailing vessel at the age of fourteen; and was so successful as a mariner that he

determined to follow the sea for a living. In due time he became a merchant and was equally successful in merchandise. Later in life he became a banker. His success may be inferred from the fact that at his death he left an estate, the estimated value of which was \$6,000,000, being the richest or second richest man in the United States. He died December 26, 1831, leaving neither widow nor children. The bulk of his large for-



Main Building, Girard College

tune he bequeathed for the endowment of a "permanent college" for the education and maintenance of "poor, white, male orphans." These orphans are admitted to college between the ages of six and ten years, and those "who shall merit it shall remain in the College until they shall respectively arrive at between fourteen and eighteen years of age." The founder directs that they shall be "instructed in the various branches of a sound education, comprehending reading, writing, grammar, arithmetic, geography, navigation, surveying, practical mathematics, astronomy, natural, chemical and experimental philosophy, the French and Spanish languages, and other such learning and science as the capacities of the several scholars may merit or warrant."

The corner-stone of the College was laid July 4, 1833, and the first five buildings were completed in December, 1847. The institution was opened January 1, 1848, with one hundred pupils. The number of boys has increased from one hundred, in January, 1848, to sixteen hundred at present, the staff of teachers and officers from seventeen to one hundred and sixteen, and the number of buildings from five to fourteen.

The affairs of the College and of the Girard estate are under the supervision of the Board of Directors of City Trusts, composed of fifteen members, including the Mayor of the city and the Presidents of the Select and Common Councils. The other twelve are chosen for life by a board of appointment composed of the twelve judges of the Courts of Common Pleas.

It is greatly to the credit of this board of management that the endowment fund has increased from an estimated value of \$6,000,000 to an estimated value of nearly \$30,000,000, from which the net annual income is now, in round numbers, \$900,000. Over \$15,000,000 has been expended upon maintenance and above 6,000 graduates have entered useful fields.

THE UNIVERSITY OF PENNSYLVANIA

The University of Pennsylvania traces its genesis to the far sighted wisdom of Benjamin Franklin. Through more than a century and a half it has steadily developed, and now ranks with the foremost educational institutions in America. The splendid grounds of the buildings devoted to its purposes occupy several blocks in West Philadelphia. Several types of architecture are represented in its many structures. Among those most recently added are the unrivalled dormitories, the Museum of Archaeology and Paleontology, in which are stored the fruits of the Babylonian Exploration Expeditions, the Law School and the Gymnasium with its famous arena of Franklin Field.

PUBLIC SCHOOLS

The public school system was organized in 1818 under an Act of Assembly of that date. There was at that time six schools, 10 teachers and 2,845 pupils; the cost of maintenance being \$23,049, and the cost per pupil, \$3.57.

The school government, as it now exists, comprises a Central Board of Public Education with forty-two members (one from each ward), the members being appointed by the Board of Judges of the Courts of Common Pleas, also a local board for each ward, composed of twelve members; this local board is elected by the people, and the members also serve for a term of three years, the member of the Board of Public Education being *ex-officio* member of the local board. To the local board is entrusted the exclusive power to elect teachers, providing that such teachers have the qualifications prescribed by the Central Board. The expenditure of appropriations is lodged with the Central Board, the money for the purpose being derived partly from taxation and partly from appropriations made by the State.

At the present time there are 277 schools, with an enrollment of 161,066, there being 79,698 boys and 81,368 girls. There are 3,853 teachers employed and the amount expended during the year 1903 was \$4,722,500.85. The cost per pupil, based upon the annual expenses, excluding permanent improvements, was \$22.07; the assessed valuation of school property is \$13,855,150.

SPECIAL SCHOOLS

There are 7 special schools, established under the Compulsory Education law; there is one elementary manual training school, one Industrial Art School, 12 Cooking Schools, 52 Night Schools, 142 kindergartens, 271 elementary schools, one Boys' High School, one Girls' High School, one Commercial High School for Girls, one Normal School, two Manual Training Schools for boys, and one School of Pedagogy for boys.

The number of children in Philadelphia between the age of 6 and 16 years was, in 1903, 212,308. There are

349 pupils holding free prize scholarships in the University of Pennsylvania and other universities and colleges. Summer schools and playgrounds are open during the months of July and August of each year.

THE FREE LIBRARY SYSTEM

It is with pride that Philadelphia points to its widespread institution "The Free Library." The system now



The Josephine Widener Branch of Philadelphia Free Library

consists of the Library itself on Chestnut Street and fourteen active branches, scattered up and down through the city, and over one hundred depositories of books known as Traveling Libraries (on account of their being changed every few months). It possesses one of the

largest collections of embossed books for the blind owned by any public library, and it has collections of rare books gradually accumulated or presented to the Library by liberal donors, some of them so rare that copies of the volumes are not to be found even in the British Museum. The patronage of the Library and its branches has been phenomenal. The Library itself was opened to the public in March, 1894, in two small rooms in the City Hall, with a nucleus of about fifteen hundred volumes. By the end of 1895 six splendid branch libraries, which had been opened under the careful management of the Board of Education, were handed over to the Free Library, and branch after branch has since been added, and owing to the munificent gift of Mr. Carnegie of a million and a half dollars the number of branches will considerably exceed the number of thirty. Mr. P. A. B. Widener has presented one branch, and Mr. John Wanamaker has just completed another, and the example set by these citizens is likely to be followed by others. To round out the work of the city, which is very widely scattered, the system will be none too big when it consists of a large, handsome, well-ordered main library with at least forty branches and some two hundred traveling libraries. Nor need this prospect be considered as far from accomplishment. In ten years the Library has assumed the proportions above described, and instead of 1,500 it owns at the present time over 263,000 volumes. Other important libraries are those of the Philadelphia Library Company, including the splendid Ridgeway Branch Library upon South Broad Street; the Mercantile Library, and that of the Historical Society.

AN AMERICAN CITY

Philadelphia still remains a distinctively American city. In no ward are there more foreigners than Americans. In the year 1900 of the entire population about 1,000,000 were native and nearly 300,000 of foreign birth. Above 84 per cent. of the native white population were born in the city, figures revealing the very general prosperity and contentment existing here.

Philadelphia stands second to Boston only in the small percentage of illiterates. The negro population, now about 65,000, or about four per cent., is increasing, due to the use of laborers upon the great public works now under way and projected.

Within the past decade the city has developed along definite lines of material wealth, methods of business, municipal improvements, public conveniences and architectural magnificence to a remarkable degree. The build-



Statue of Gen. Reynolds, City Hall Plaza

ers of homes have undoubtedly gone far beyond the normal demand of an increasing population and rents are at a low figure. This generation lives in far greater comfort upon a given sum than any of those preceding it.

PHILADELPHIA'S RESOURCES

In 1897, before the beginning of the "boom," the national banks in Philadelphia had on deposit \$131,141,907, and their total resources were \$177,829,508. The latest bank statement showed deposits of \$241,642,629 and total

resources of \$300,911,009, a gain of about 80 per cent. The Trust companies, Saving Funds and State banks of the city reported in 1879 total resources of \$251,069,953. In 1903 they had \$404,136,205, an increase of \$152,910,657, or quite 60 per cent.

In addition to this, the same institutions held, in 1879, trust funds to the amount of \$355,219,548. In 1903 these trust funds, which represent generally the most solid investments, had increased to \$433,904,535, a gain of \$78,720,987, or 22 per cent.

The aggregate of the financial resources of these various institutions, with the investments intrusted to them, has grown by 45 per cent., from \$784,119,009 in 1897 to the enormous figures of \$1,139,987,749—an addition of \$355,868,704 in six years.

With more than a billion dollars accumulated in its financial institutions Philadelphia cannot complain of poverty.

THE CARPET INDUSTRY

The making of carpets and rugs in this city is an industry of such vast proportion as to deserve special reference. Above 12,000 people are employed in the mills and the annual product had a value of nearly or quite \$23,000,000, or nearly half the amount of all carpets produced in this country.

Other lines which have developed largely under favorable conditions in this city are leather and leather goods, cottons, boots and shoes, fine hats, wall papers, oilcloths, steel, scientific and surgical instruments and printing.

With reference to all forms of creative industry New York City outranks forty-nine States and Territories in the value of products, Chicago outranks forty-seven, and Philadelphia forty-five.

OUR EXPORT INTERESTS

Philadelphia is the centre at the present time of a great and intelligently conducted movement looking toward a comprehensive and permanent foreign trade.

This line of effort had its beginning in the Pan-American Conference of a dozen years ago, which was so earnestly fostered and guided by the late Hon. James G. Blaine. It was halted for a time by adverse political conditions, but under the sunlight of renewed prosperity and favorable legislation, it has again become a leading thought with our great manufacturers.

THE COMMERCIAL MUSEUM

The city of Philadelphia organized the now famous Commercial Museum, which, although still in temporary quarters, contains the most valuable and concrete collection of raw and manufactured products of the nations ever brought together for the instruction of the busy world. Great buildings, which are to be permanent, will hereafter contain this and added collections, together with every possible form of information which will enable the American workman to produce the goods required by the people of other lands. It will, in fact, become the University of Commerce, and as such will attract the wide-awake manufacturers of every city in the land.

THE SPLENDOR OF OUR SUBURBS

As truly as "the glory of a woman is her hair," the pride of a city like Philadelphia is in the cordon of lovely country settlements which encircle her brow like a diadem. Many electric and steam lines make speedy runs between these shady, refined retreats and the heart of the city. These near-by residence sections are threaded by a maze of well-graded and picturesque drives, and the splendor of many of these rural estates is impressive.

Andalusia and Torresdale are reached via the Pennsylvania Railroad, the Bristol Electric Line and the up-river steamboats. Pelham, Wissahickon Heights and Chestnut Hill are all at the further extreme of Germantown.

Along the New York Division of the Philadelphia and Reading Railway are Logan, Oak Lane, Elkins, Ogontz

Park, Wyncote and Jenkintown. In the vicinity of the Cheltenham Hills, as this district is called, are several of the costliest private homes in America.

Along the main line of the Pennsylvania Railroad are such well-known settlements as Overbrook, Narberth, Ardmore, Bryn Mawr, St. David's, Wayne and Radnor. To the southwest are Lanerch, upon the West Chester Pike, and Swarthmore and Lansdowne, upon Baltimore Pike, reached by the "Central Division" of the Pennsylvania Railroad. The Darby district and the hills along pretty Darby Creek is a popular neighborhood, while over in New Jersey beyond Camden many affluent business men have located their homes.

The semi-rural character of West Philadelphia has attracted thousands of families from the old city. This is especially true of the beautiful district to the southwest, reached by the Chester Avenue cars, and of the modern operations bordering upon the West Park.

No visitor to our city can claim to have fairly gained an idea of Philadelphia's home life until he has visited some of these attractive outer points.

RAILROAD TERMINALS

In no city of the world are there more magnificent railroad terminals than exist in Philadelphia. The Broad Street Station of the Pennsylvania Railroad has been a model of a perfect railroad building for years, but it will soon be developed into a greater and much more commodious structure, imposing in appearance and more perfect in its arrangement than the old. This and the magnificent Market Street Station of the Philadelphia & Reading Railway are among the largest in the world. Philadelphia, therefore, has two of the greatest passenger terminals ever built, beautiful alike in grandeur and architectural features, and as complete as the suggestions of experienced railroad men could make them.

Another passenger terminal, not as large as those of the Pennsylvania and the Philadelphia & Reading Roads, is that of the Baltimore & Ohio Railroad, at Twenty-

fourth and Chestnut Streets. It is of sufficient size to accommodate the growth of the business of this trunk line for several years, and is not lacking in the conveniences for passengers and trains known to modern rail-roading. All of the great passenger stations are located within the heart of the city on the main artery of traffic and close to the centres of every line of trade.

THE PHILADELPHIA BOURSE

This notable addition to the city's facilities for conducting business occupies a space north of Chestnut and between Fourth and Fifth Streets. It should be visited by all strangers. The proceedings upon the "floor" may be viewed from the gallery, second story. The basement contains a permanent exhibition of machinery. A fine restaurant occupies the eighth floor. The Trades League, Maritime Exchange, Board of Trade, Commercial Exchange, Lumber, Drug and other Exchanges are located in the Bourse.

THE PORT OF PHILADELPHIA

This port has a wharfage front accessible to ocean steamships of nearly thirty-three miles, and anchorage room sufficient for all time. Engineering operations are in process of affording deeper water over the shoals of the lower river, thus admitting in the future the largest types of maritime carriers at all stages of tide.

Wharf owners are very generally building out to the new Port-Warden's line and the great tide terminals of the railroads above and below the city proper are of vast proportions.

Philadelphia continues to be the second port in point of its volume of traffic upon the Atlantic seaboard.

The largest items of export are coal, petroleum and breadstuffs. A leading article of import is sugar.

The vast ship-building interests and development of the United States Navy Yard at League Island greatly increase the importance of the port in marine construction, refitting and repairs.



Looking North along Delaware Avenue

SHIPBUILDING

The Delaware River is sometimes called the Clyde of America. Shipbuilding has flourished here from the early days of Penn's Colony. When ships of metal began to supersede those of wood the Delaware ship-yards had a marked advantage. It is only within the past fifteen years that the value of iron and steel vessels annually produced in America exceeded the cost of wooden ships. Nearly one-half of all the vessels built at American yards on both the sea and the Great Lakes are made here, principally at two great yards.

UNITED STATES NAVY YARD

The United States Navy Yard at Philadelphia is located at League Island, at the junction of the Delaware and Schuylkill rivers, at the southern extreme of the city of Philadelphia, and about one hundred miles from the mouth of the Delaware River, having an area greater than the combined dock yards of Great Britain.

The advantages of this yard, in the order of their importance, are considered to be as follows:

1. Fresh water, which is also of excellent quality for boiler feed water.
2. Comparatively cheap labor, and a large industrial population to draw from.
3. An unusual amount of water front.
4. Proximity to supplies of coal and iron.
5. Connection with railway lines, one of which runs into the yard, which enables material to be delivered direct from the source of supplies.
6. The trolley line connecting with the city of Philadelphia.
7. Fairly moderate climate.

The disadvantage of ice in winter is overcome by the large reserve basin not affected by floating ice, and its distance from sea affords security from attack by a foreign enemy.

It is expected that the citizens of Philadelphia will use every endeavor to secure a deep water channel of

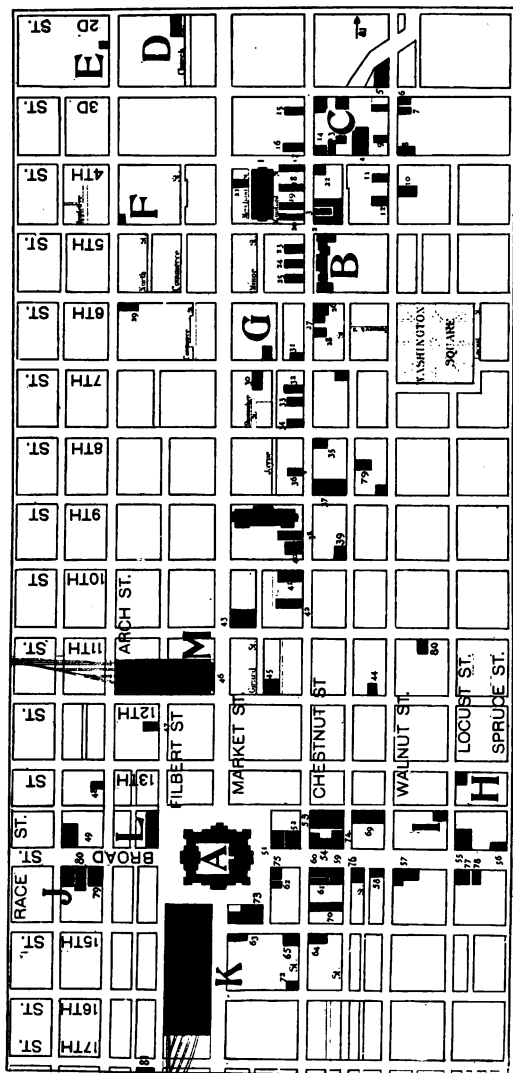
thirty-five feet from the sea to the city. This would insure free and safe navigation of the river by our largest battleships.

The development of this yard on broad lines in the interest of the national defense is greatly to be desired. The Navy Department has shown its appreciation of this by recommending large appropriations for necessary buildings required for a large naval establishment, and the appropriations for this yard by the last session of Congress have not been exceeded by those appropriated for any other yard in the country.

This yard is a centre of the recruiting service and for fitting out vessels in commission. The plans provide for a reserve basin of nine slips aggregating four miles in length. The area of this yard is equal to all of New York city below Eighteenth Street.

KEY TO MAP OF CENTRE OF PHILADELPHIA

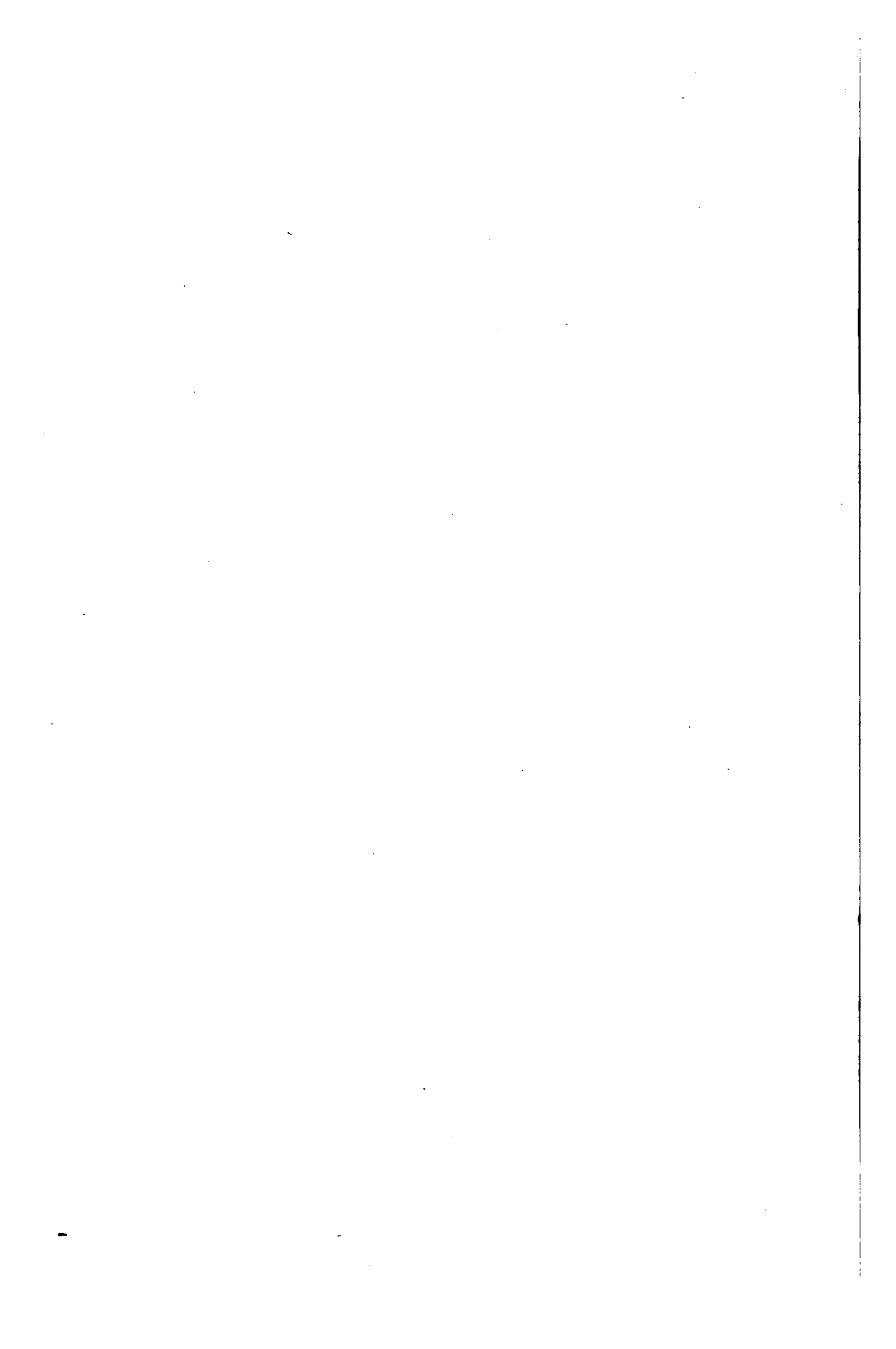
- | | |
|---------------------------|---------------------------|
| 1 Bourse | ance Company |
| 2 Drexel Bldg. | 18 Philadelphia National |
| 3 Independence Bank | Bank |
| 4 Bullitt Bldg. | 19 Farmers' and Mechan- |
| 5 Stock Exchange Bldg. | ics' Bank |
| 6 Union Insurance Bldg. | 20 People's Bank |
| 7 American Fire Insur- | 21 Bell Telephone Bldg. |
| ance Bldg. | 22 R. D. Wood Bldg. |
| 8 Manhattan Life Insur- | 23 North American Trust |
| ance Bldg. | Company Bldg. |
| 9 Liverpool, London and | 24 Pennsylvania Company |
| Globe Bldg. | for Insurance on |
| 10 Commercial Union | Lives Bldg. |
| Bldg. | 25 Real Estate Title Com- |
| 11 Fire Association Bldg. | pany Bldg. |
| 12 United Firemen's Bldg. | 26 Ledger Bldg. |
| 13 Forrest Bldg. | 27 Land Title and Trust |
| 14 Brown Brothers Bldg. | Company Bldg. |
| 15 Clearing House | 28 German Demokrat Bldg. |
| 16 Fidelity Trust Co. | 29 Knickerbocker Ice Co. |
| 17 Provident Life Insur- | Building |

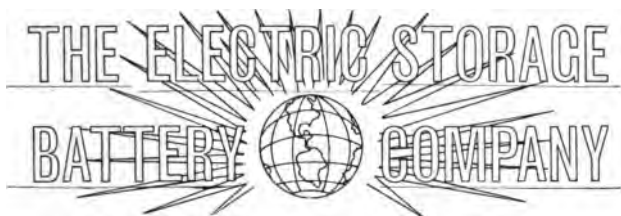


The Centre of Philadelphia

- | | | | |
|----|--|----------|-------------------------------------|
| 30 | Builders' Exchange
and Franklin Inst. | 53 | Garrick Theatre |
| 31 | Girard Fire Insurance
Company Bldg. | 54 | Real Estate Trust
Company |
| 32 | Guarantors' Company
Bldg. | 55 | Hotel Walton |
| 33 | Union Trust Company
Bldg. | 56 | Hotel Stenton |
| 34 | Green's Hotel | 57 | Hotel Stratford |
| 35 | Times Bldg. | 58 | The Bellevue |
| 36 | Commonwealth Title
Company Bldg. | 59 | Land Title Bldg. |
| 37 | Continental Hotel | 60 | Land Title Bldg. |
| 38 | Record Bldg. | 61 | Citizens' Trust |
| 39 | Philadelphia Electric
Company offices | 62 | Baxter Bldg. |
| 40 | Penn Mutual Ins. Co.
Bldg. | 63 | Harrison Bldg. |
| 41 | Mutual Life Ins. Co.
Bldg. | 64 | Colonnade Hotel |
| 42 | Watkins Bldg. | 65 | Pennsylvania Bldg. |
| 43 | Bingham House | 69 | Witherspoon Bldg. |
| 44 | Franklin Bldg. | 70 | Baptist Publication
Company Bldg |
| 45 | Girard Estate Bldg. | 71 | Vulcanite Bldg. |
| 46 | Reading Terminal
Bldg. | 72 | Loder Bldg. |
| 47 | Heed Bldg. | 73 | Arcade Bldg. |
| 48 | 1305 Arch Street | 74 | North American Bldg. |
| 49 | Odd Fellows' Hall | 75 | West End Trust Co. |
| 51 | Betz Bldg. | 76 | Union League |
| 52 | Girard Trust Co. | 77 | Academy of Music |
| A | City Hall | 78 | Horticultural Hall |
| B | Independence Hall | 80 | General Electric Bldg. |
| C | Carpenters' Hall | 81 west. | Bell Telephone
Bldg. |
| D | Christ's Church | 81 east. | Keystone Tele-
phone Bldg. |
| E | Old Flag House | G | Franklin Institute |
| F | Franklin's Grave | H | Historical Society |
| | | I | Philadelphia Library |
| | | K | Penna. R. R. Station |
| | | L | Masonic Temple |
| | | M | Reading Terminal Sta. |

***THE ELECTRIC STORAGE
BATTERY COMPANY***





THE ELECTRIC STORAGE BATTERY COMPANY, of Philadelphia, was organized in the year 1888, and its factory was located in Gloucester, N. J., until the year 1894. In 1892 the company made its first installations of the "Chloride Accumulator," these words characterizing the special construction of the plates then made. From that time the term has been utilized as the registered trade-mark of the company, and is applied generally to all the batteries made by them, excepting those used for vehicle work, which bear the trade-mark The "Exide" Battery.

In 1894 the development of the industry was hampered so much by patent litigation that the Electric Storage Battery Company acquired by purchase all the basic patents and patent rights underlying the manufacture of storage batteries, and by this means secured to itself the sole right to supply in the United States all the important types of storage batteries developed to that time, and has since acquired a large number of patents both on storage batteries and auxiliary apparatus, so that it may be said to control the storage battery business in the United States. This is well illustrated by the fact that over 95 per cent. of batteries installed in this country are of their manufacture.

The alliance which about this time had been formed with the Chloride Electrical Storage Syndicate, Ltd., of England, the "Accumulatoren Fabrik Aktien-Gesell-

schaft" of Germany, and the "Société Anonyme pour le Travail Electrique des Métaux" of France, also secured to the company the control of these companies' patents for the United States and the benefit of all future improvements made by them.

The successful operation of the plants installed for lighting and power and railway work created a demand for storage batteries in excess of the capacity of the Gloucester factory, so that in 1894 the company secured additional quarters in the large Warden Power Building, located at Eighteenth street and Allegheny avenue, Philadelphia, Pa., at which place, with greater shipping facilities and enlarged space, the manufacture of the "Chloride Accumulator" has continued on an increasing scale, until the company, on account of the magnitude of its business and the number of its working force, found it advisable to secure not only the entire Power Building, but also all the buildings contained on the large triangular plot of ground bounded by Allegheny avenue on the north, the Pennsylvania Railroad on the west, and the Philadelphia & Reading Railway on the east. This entire plant, which it now owns, consists of the main building and twenty separate structures devoted to the different processes of storage battery manufacture.

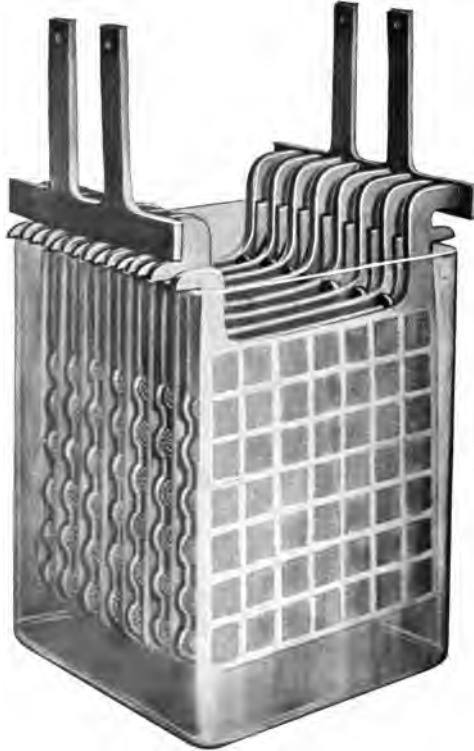
The cut on the opposite page gives a general view of the works from the western and southern sides, the executive offices being located on the seventh floor of the main building, and the offices of the engineering, operating, accounting, purchasing, order and superintendent's departments, etc., occupying the front portion of the central pavilion on the floors beneath.

The first floor in the north wing is taken up by the machine shop and shipping department, the second floor by the tank department and carpenter shop and the commercial and experimental laboratories, the third floor by the general store rooms, the fourth floor by the lead burning, construction, draughting room and blue print departments. The sixth floor is utilized for a tank store room. The front portion of the sixth floor includes the accounting room, the order and estimate departments, the



Works of The Electric Storage Battery Company, Philadelphia

Pennsylvania sales offices, the vehicle battery department, the filing and mailing department, and the purchasing department. The basements of the main building are taken up by the assembling department, and for the storage of pig lead, alloy and other metals.



An Element of Standard Type in Glass Jar

The low building facing the main structure is utilized for the forming room, and in the rear for the engines and generators required for this work. The buildings extending along the south side include the furnaces and machinery used in casting the different types of plates

manufactured by the company. All these buildings are connected by the tracks of a commercial electric railway, the handling of the weighty product being greatly expedited in this way.

The facilities for shipping and receiving goods are excellent, as both the Pennsylvania Lines and the Philadelphia and Reading Railway have tracks running into and alongside the property with abundant platforms and sidings for the convenient loading and unloading of cars.

Over a thousand employees are engaged in the different departments of the works and in the sales offices of the company. These latter are located in New York at 100 Broadway; Boston, 60 State street; Chicago, Marquette Bldg.; Cleveland, Citizens' Bldg.; St. Louis, Wainwright Bldg.; San Francisco, Rialto Bldg.; Philadelphia, Allegheny avenue and Nineteenth street, and in Toronto, Canada, in the offices of the Canadian General Electric Company, Ltd.

Among the illustrations are shown a few of the types of the "Chloride Accumulator," and the manner in which the plates are assembled to form a complete element—each element, together with the containing glass or rubber jar or lead lined tank, being designated as a cell, and any number of cells connected, being termed a battery.

THE "CHLORIDE ACCUMULATOR" IN RAILWAY SERVICE

The use of storage batteries in connection with electric railways has been shown to possess so many desirable features, both in the economical operation of the road and the flexibility of service secured through their use, that in many instances the installation of one battery has been followed by a number of others for the same company. The Philadelphia Rapid Transit Company, who in 1896 installed its first battery of "Chloride Accumulators," has from time to time added others until now they operate six batteries on their system.

The Union Traction Company of Indiana operate sixteen batteries on their system, the Pittsburg Railways

nine, the Buffalo Railway Company five, the Detroit United Railway two, the New York City Railway ten, the Los Angeles Railway Company three, and the Washington Railway and Electric Company seven batteries.

The railway battery illustrated has a capacity of 2,500 amperes and is installed near the power house for the



Type of Cell used for Central Lighting Station

purpose of regulating the fluctuations of load, and to relieve the generating machinery of the severe strains incident to sudden changes of load. The largest individual installation of storage batteries in the world for railway service is that of the St. Louis Transit Company, which has recently installed a battery of "Chloride Accumulators" having a capacity of 3,000 kilowatts. Three hundred and seventeen installations of the "Chloride Ac-

cumulator" have been made for this class of service, aggregating in capacity 190,000 KW. hours of battery output.

THE "CHLORIDE ACCUMULATOR" IN CENTRAL LIGHTING AND POWER STATIONS

The central station battery shown is an example of the type used for Edison Central Lighting and Power Sta-



A Typical Installation of "Chloride Accumulators" for Railway Service

tions. This battery, having a capacity of 1,500 KW., is utilized for taking the peak of the load, and in this way avoids the necessity of operating extra generating machinery during the hours of heavy demand. It is also used as a reserve in case of emergency.

The New York Edison Company now has in operation on its system and contracted for twenty-five batteries of "Chloride Accumulators," having an aggregate capacity of 33,178 KW. hours. The first battery installed for this company was in 1895, this being the first large central station battery built in this country. A second bat-



A Typical Installation of "Chloride Accumulators" for Central Station Service

tery was installed in 1896, followed in 1898 by three more. In 1897 seven batteries were contracted for and installed. In 1900 one battery was installed and in 1902 eight more. Since that time four more have been erected, making, as stated, twenty-five large central station batteries operated in this one city.

Among the largest installations of storage batteries

made by the company may be mentioned those for the Chicago Edison Company. The first battery for this company, which was installed in 1897, consists of 166 cells, 83 of which are arranged on each side of the three-wire system, and has a capacity of 22,400 ampere hours; each cell in this battery is $21\frac{1}{2}$ inches wide, $79\frac{3}{4}$ inches long and $43\frac{7}{8}$ inches high and weighs 6,200 pounds. The total weight of this battery exclusive of conductors is 1,029,200 pounds and represents the largest installation of storage battery ever made up to that time. The Chicago Edison Company now has in operation on its system seventeen batteries of "Chloride Accumulators," having an aggregate capacity of 33,500 KW. hours, several of these batteries being of almost equal capacity to the original installation. The Chicago Edison Company, it may be mentioned, now possesses in the three batteries installed at the Adams street station the greatest capacity of storage batteries located under one roof in the world.

The Edison Electric Illuminating Company of Brooklyn operates eight batteries, having a capacity of 9,803 KW. hours, and the Edison Electric Illuminating Company of Boston has in operation or in process of construction nine batteries of "Chloride Accumulators," having an aggregate capacity of 14,346 KW. hours. One hundred and seven installations have been made for this class of service, the aggregate capacity being 145,000 KW. hours of battery output.

THE "CHLORIDE ACCUMULATOR" IN ISOLATED LIGHTING AND POWER SERVICE

The illustration of a battery installed in a residential power house is a typical example of a small plant classed under Isolated Lighting and Power Service. Five hundred and fifty-six installations have been made in this class, the aggregate capacity amounting to 29,575 KW. hours.

Extensive use is made of the "Chloride Accumulator" in telegraph, telephone, car lighting, electric launch and automobile service, the different types of cells used for



A Typical Installation of Chloride Accumulators for a Residence Plant



A Cell of the "Exide" Type

these demands aggregating over 75,000 KW. hours in capacity.

THE "EXIDE" BATTERY IN VEHICLE SERVICE

The "Exide" battery was introduced by this company



An Assembled "Exide" Battery in Trays

to meet the requirements of certain classes of electric vehicle service.

The rapidly increasing demand for both pleasure and business vehicles operated by electric power prompted the company to place on the market this type of cell,

which, while considerably lighter per horse power than the "Chloride" cell, yet embodies with this lightness a structural strength which makes it the standard cell for vehicle service.

This is shown by the fact that nine-tenths of all electric vehicles are equipped with the "Exide" battery, and, while extravagant claims for mileage and weight have never been made for this battery, so extensively has it been supplied that at this time sixteen "Exide Battery Depots" in principal cities of the United States are utilized by the company for the convenience of those using this type of cell. These "depots" being under the care of an



A Portable Battery

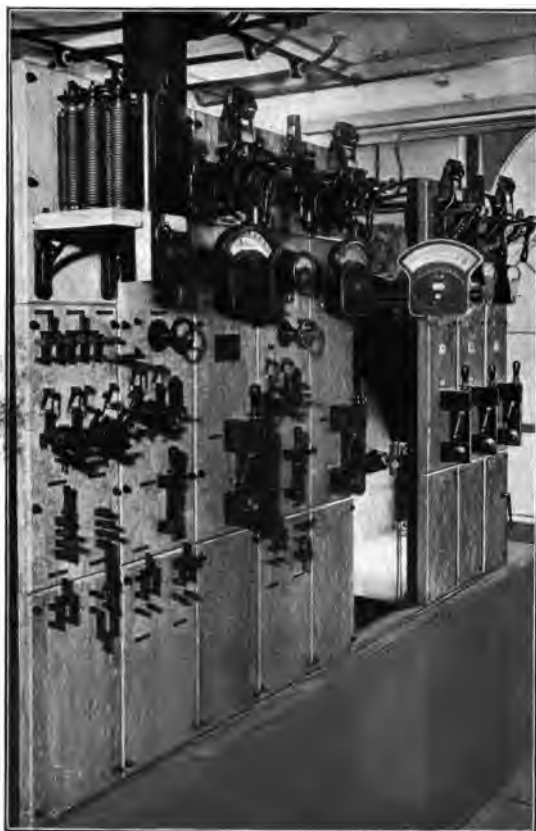


A Laboratory Cell

expert battery man, are equipped with a stock of battery material and possess facilities for recharging and caring for these cells.

There are thirty-eight different types of batteries manufactured by the Electric Storage Battery Company, and many capacities are furnished under each type. They are specially constructed to meet the different requirements of service to which storage batteries are adapted, and represent the most modern methods of battery manufacture.

Taking all types of batteries, from the smallest laboratory cell weighing less than a pound to the large central station type, each cell of which weighs two and a half tons or more—the total output of "Chloride Accumulators" aggregates almost a half million of kilowatt hours in daily service.



Switch Board, designed and constructed by
The Electric Storage Battery Co.

The officers of the company are: Mr. Herbert Lloyd, F. C. S., president and general manager, who has from the earliest days of the organization personally directed the commercial and manufacturing interests of the company, and whose patented processes for the casting of grids and other labor saving devices have contributed largely to the practical and commercial success of the storage battery: Mr. George D. Widener, first vice-president; Mr. John R. Williams, second vice-president; Mr. Walter G. Henderson, secretary and treasurer; Mr. Frank C. Lewin, assistant secretary and treasurer.

The following gentlemen prominent in the business and financial world constitute the board of directors: Messrs. Peter A. B. Widener, Harry Payne Whitney, Herbert Lloyd, George D. Widener, Thomas Ryan, A. N. Brady, Grant B. Schley, Rudolph Ellis and Thomas Dolan.

*THE BALDWIN LOCOMOTIVE
WORKS*

THE BALDWIN LOCOMOTIVE WORKS

ELECTRIC LOCOMOTIVES AND ELECTRIC CAR TRUCKS

THE introduction of electricity as motive power necessitated many changes in electrical equipment to bring it into conformity with the new requirements. Motors of special design and construction were required to meet the exigencies of speed and power and at the same time conform to the limitation of space afforded for the working parts. Greater changes still were required in the rolling equipment. The divergence in the operating conditions rendered existing designs of steam locomotives entirely inadequate. New types, new methods and new patterns were necessary, the arrangement of which involved considerable engineering ability.

The long experience of the Baldwin Locomotive Works in building steam locomotives and the skill of the Westinghouse Electric and Manufacturing Company in the production of electrical appliances made it particularly suitable that these two companies should join in the manufacture of electric locomotives. To this end in 1896 a working arrangement was made whereby the Baldwin Locomotive Works were to build the running gear and the Westinghouse Company furnish electrical equipment for locomotives operated by electricity, not including street cars or electric car trucks. Since the time this agreement was entered into both companies have worked together to develop and improve the system.



Baldwin-Westinghouse Electric Locomotive, for Mine Haulage Service
Built for Berwind-White Coal Mining Company

Mine haulage offered a convenient and economical field, and electric locomotives for this branch of industry were among the first to be constructed. Their compactness made them adaptable to low and narrow entries. The moving parts are easily protected from external injuries. The mechanism is simple and the cost of maintenance is reduced to a minimum figure. In some cases electric power had already been established for lighting, ventilating or other purposes. In such instances the same generating plant could be utilized to furnish power for the locomotives.

The use of electric locomotives in mines has now long passed the experimental stages. The amount of saving effected by their use will vary with the conditions which exist in each individual case. Instances have been reported in which careful comparisons have been made between electric and other haulage and the results show that aside from the interest on the electrical investment the cost of traction has been reduced from eight and in some cases ten cents per ton to about one cent per ton. The saving in the item of attendance alone has amounted to 30 per cent. on the cost of the electric installment.

The Berwind-White Coal Mining Company, with mines in Somerset County, Pa., use electric power extensively for mine haulage. The company's property extends over seventy square miles and is being rapidly developed, seven mines being already in operation. A typical installation for this mine is two 150-Kw. direct-current generators supplying a current of 500 volts for the haulage system and for lighting the mine. One of the locomotives recently built for the company by the Baldwin Locomotive Works is shown on page 66. The road is three feet gauge. The locomotive is equipped with two electric motors having a normal rating of 50 horse-power each. The driving wheels are thirty inches in diameter and the total weight of the locomotive is 21,350 pounds. It is capable of developing a draw-bar pull of 4,300 pounds on a level with a full load.

The locomotive illustrated on page 68 is of similar type, built for the Norfolk Coal & Coke Company. This



Baldwin-Westinghouse Electric Locomotive, for Mine Haulage Service
Built for Norfolk Coal and Coke Company



Baldwin-Westinghouse Electric Locomotive, for Mine Haulage Service
Built for Pittsburg Coal Company

company is among the large operators in the West Virginia coal fields who are using an extensive system of electric equipment in their mines. The locomotive shown, except that it is for a gauge of 3 feet 2 inches and weighs 30,700 pounds, is otherwise quite similar to the one already described for the Berwind-White Company.

Both of these locomotives are on exhibition at the Louisiana Purchase Exposition at St. Louis.

A mine locomotive built for the Pittsburg Coal Company, illustrated on page 69, shows a type differing from those previously described in that the driving wheels are placed outside the frames, giving less side overhang of the locomotive outside the track gauge. Where the width of gauge is sufficient to admit placing the frames in this way without interfering with the clearance of the motors, some advantages are experienced, mainly in the increased distance between the side of the locomotive and the walls of the tunnel, and the greater accessibility which may be obtained by this arrangement for the driving wheels and brake attachments.

The extent to which motor driven passenger cars are used has proved their utility. Aside from this class, however, numerous electric locomotives are employed on short lines of railroads; for switching purposes at the terminals; in industrial establishments, mills, furnaces, plantations, etc. The former class may be properly considered as cars mounted on electric trucks in contradistinction to the electric locomotives which are used only for hauling power.

For electric railway service in general where it is not convenient to equip each individual car with motors this form of locomotive is found convenient. It is the usual practice to place a motor in connection with each pair of wheels, thus utilizing all the weight of the locomotive for tractive power. A type for heavy service is shown on page 71, built for the Pascagoula Street Railway and Power Company and used for switching service. This locomotive is for 4 feet 8½ inch gauge and is equipped with four motors of 50 horse-power each. The line pressure is 500 volts. The total weight is 55,700 pounds, and



Baldwin-Westinghouse Electric Switching Locomotive

it is capable of exerting a draw-bar pull of 8,600 pounds on a level. This type is suitable for logging and other heavy service. For plantation and industrial service it is



Electric Motor Truck, built for Interborough Rapid Transit Company of New York

common to use a four-wheeled locomotive with motors and weight to suit the traffic conditions.

In interurban or elevated railway service, where the passenger cars are mounted on electric trucks it is neces-

sary to use greater care in the construction of the rolling equipment than is required in the ordinary passenger car. The trucks are not only obliged to carry the weight of the car under maximum condition of load, but in addi-



Electric Motor Truck, built for Illinois Central Traction Company

tion the dead weight of one or more motors, and be capable of withstanding, without distress, the torsional and lateral strains exerted by the motors when in operation. Under such conditions each motor truck becomes itself a locomotive, and in order to secure best results must be given the same consideration in the way of design and

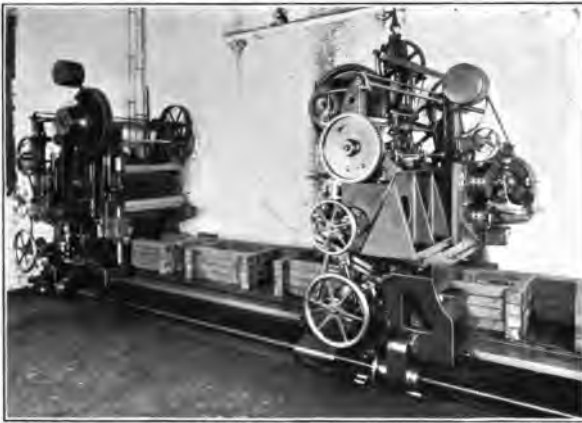
construction as if it were to be used separately as such. The trucks here given show three of the principal designs manufactured by the Baldwin Locomotive Works, all of which are used in high speed interurban service.



Electric Motor Truck, built for Twin City Rapid Transit Company

The heaviest construction is that represented by the truck built for the Interborough Rapid Transit Company of New York, shown on page 72. This was designed to meet the requirements of service on this road. An approved design for heavy service is represented by the truck built for the Illinois Central Traction Company,

shown on page 73. This has a square wrought iron frame and is of the regular Master Car Builders pattern. Another similar design, but somewhat lighter in construction, is represented by the truck built for the Twin City Rapid Transit Company of Minneapolis and St. Paul, shown on page 74. The design has been adopted by this company for both heavy street car and light inter-urban service.

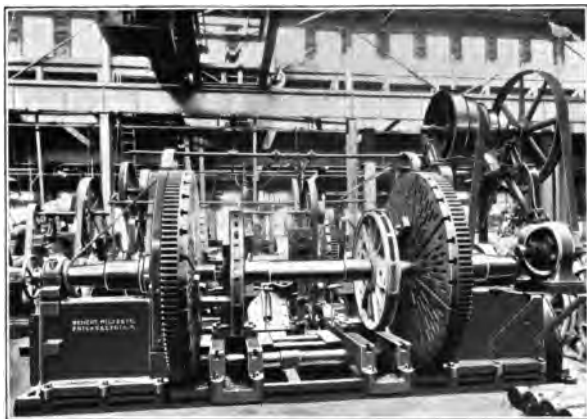


Double-head Frame Slotting Machine, driven by Individual Electric Motors, Baldwin Locomotive Works

These trucks are all machine-fitted throughout, gauges and templates being used the same as in locomotive practice. This insures not only accuracy of the workmanship but interchangeability of parts.

A feature in the economy of the Baldwin Locomotive Works is the electric power transmission, by which many of the larger tools are driven by individual electric motors. By this arrangement the line shafting is done away with and the power for driving the machine is dependent entirely upon the motor, which can be shut off and the expenditure stopped when the machine is idle. The illustration herewith shows a double-headed slotting

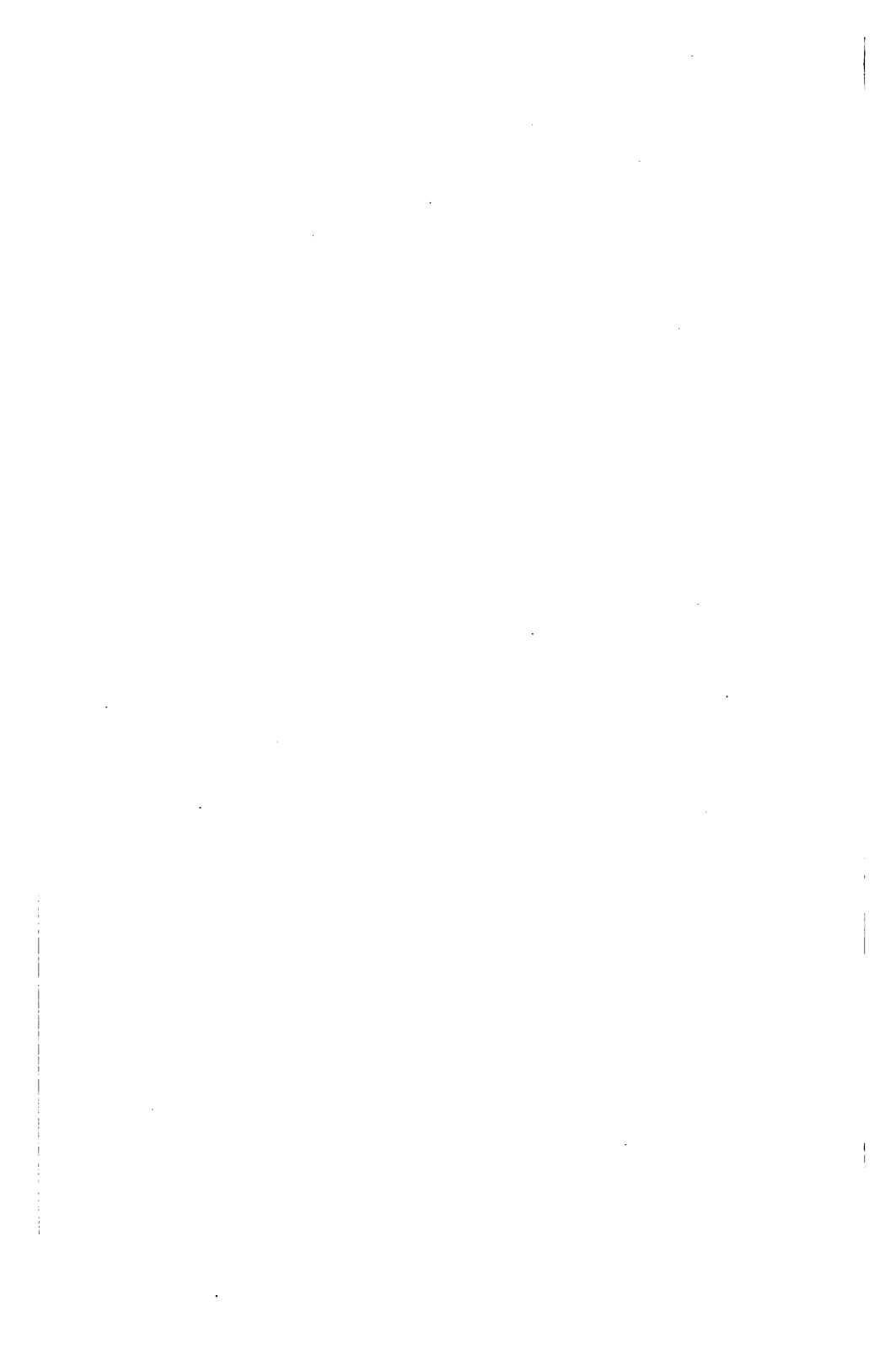
machine, a special tool for finishing locomotive frames. Four frames each five inches thick can be operated upon at one time. Two independent heads and tools are used, each operated by a separate electric motor of 10 horsepower each. Another example of electrically driven machinery is given by the illustration of the large wheel



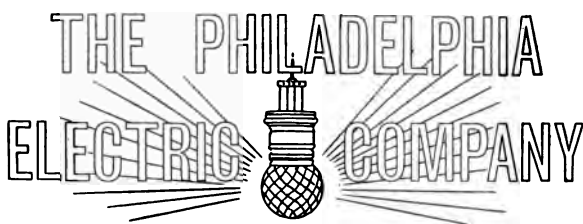
Wheel Lathe with Electric Motor Drive
Baldwin Locomotive Works

lathe on this page, for turning locomotive driving wheels and tires. This is one of a large number of machines placed closely together to economize space. All overhead shafting is done away with and the machines are served by electric cranes. By this arrangement an increase of about 33 per cent. was made in the capacity for work and about 33 per cent. increase in storage facilities over the old method of belt-driven hand-served machines.

*THE PHILADELPHIA ELEC-
TRIC COMPANY*



THE PHILADELPHIA ELECTRIC COMPANY



PHILADELPHIA comprises an area of over 129 square miles, and the demand for current comes from all quarters of the city. Formerly, there were twenty-seven electric companies with eighteen different operating companies distributed throughout the city and suburbs, each of the companies operating on an entirely separate and independent basis by reason of its franchise, and thus preventing a consolidation of organization and operation similar to that in other large cities. The distribution of current by these various companies included practically all of the methods used commercially, viz.: direct current of 500-volt, two-wire, 110-volt two-wire, and 220-volt three-wire systems; also single-phase alternating current, two-phase alternating current, and three-phase alternating current, with frequencies of 60, 66, 125 and 133 cycles. The voltages of the alternating-current feeders were 1,000 to 1,200 and 2,000 to 2,400 volts. The total number of consumers of these various companies was over 13,700, using 13,973 series arc lamps, 3,758 incandescent arc lamps, both direct current and alternating current, 16,000 H. P. in motors, and 494,000 incandescent lamps. The total equivalent connected load in 16-c. p. lamps was 878,000. The yearly Kw.-hours manufactured at these various stations were 59,405,970, divided as follows: Incandescent and power, 35,081,545; arc, 24,324,425. It was such a system that required to be unified and harmonized.

In the consolidation of a number of electric lighting and power properties, the first essential is a uniformity in the supply of current to the various consumers. Conditions existing in Philadelphia were similar to those in other large cities in which are located a number of small plants, some supplying alternating current and some direct current—those supplying alternating current having a voltage differing somewhat from the latter. Before, therefore, effectual consolidation could be made of the operation of these plants, attention was given to the distributing system; and after a careful study of the situation it was decided to adopt the two-phase 60-cycle alternating-current distributing system for most of the territory, and the direct-current, 220 volt, three-wire system for the principal business section of the city. This simplified the generating station as it required only one type of generator to supply directly all of the alternating current, and indirectly the direct current by means of high voltage alternating-current motors and 300-volt direct-current generators.

The entire distributing system was reconstructed so as to obtain a uniform primary and secondary distribution, and change the single-phase to two-phase circuits. All primary circuits were arranged for voltages ranging from 2,200 to 2,400 volts, and secondary, from 110 to 120 volts. Tie lines were installed between the various distributing centres, these tie lines being operated at 5,500 volts, which is the voltage of the generating station.

After the completion of the plans for the distributing system, a careful survey was made of the property on both the Delaware and Schuylkill Rivers to obtain a site for the main generating station. After examination of the properties obtainable, preliminary plans were made showing the ultimate capacity to be obtained on the properties. These plans were submitted to Mr. John T. Windrim of the firm of James H. Windrim, Architect, Philadelphia, who prepared the plans of the first section of the building. In selecting the site for the main generating station it was essential that enough ground be obtained to admit of an increase of at least ten times the

first necessary equipment, so as to take care of any increase in capacity required for the large growth of the business during a period of years.

The site finally selected is, for many reasons, probably ideal. The total area is about nine acres, extending from the Schuylkill River front a distance of 1,304 feet



Main Generating Station—Alternating Current

without being divided by streets. The actual distance from the central station to the centre of the load district is about three miles. This property is bounded on the one side by the Pennsylvania Railroad and on another by the Baltimore & Ohio Railroad, and on the other side by Christian Street, a broad and well-paved avenue.

For the reasons above mentioned, it was decided to design the station on a sectional plan, in order that it

could be extended in one direction to the end of the building lot, each lineal foot of station giving a proportionate increase of switchboard, engine room, boiler room and auxiliary capacity. This necessitated that all of the apparatus be laid out in parallel lines, and the crossing or mixing of various classes of apparatus prevented by careful attention to details.

The first section of the building was located 360 feet from the river in order to admit of an arrangement of coal storage at both ends of the complete plant. It will be seen that this property is somewhat triangular and that the width of the property increases eastward. The first section of the building was naturally located nearest the river.

The generating station consists of two buildings, one a boiler room and the other an engine room arranged with a number of mezzanine floors for switchboard galleries. The smoke-stack was placed outside of the building, first, to avoid taking up space in the building required for boiler purposes, and, second, the space was available outside and could be utilized to no better advantage.

The first work was arranging the foundations of the building, and the intake and discharge water conduits for condensing purposes. It was decided to arrange the intake and discharge conduits triangularly and construct them of concrete which would fulfill the function of foundations for the division wall between the engine room and the boiler room. The reasons for establishing this location was that water is required in both the engine and boiler-room buildings, and connections could readily be made to both sides of this conduit. The placing of the conduit in any other location would necessitate carrying the foundation for the columns of the building on either side down to a lower depth, thus increasing the cost. The arrangement of the conduits permitted of the desired capacity with minimum depth of excavation. The two lower intake conduits are each 7 feet in diameter and joined with cross-connections of 4 feet at frequent intervals. The discharge conduit is elliptically shaped,



Height of Stack, 275 feet; Inside Diameter, Top, 18 feet; Inside Diameter, Base, 23 feet

being 12 feet in height by 8 feet wide. Connections to the intake conduit are made by walls so that the intake pipes can be dropped down and be continuously submerged. The top of this conduit was entirely covered with 20-inch I-beams; and at the points where the columns rest, additional I-beams were placed across those upon which the bolsters rest, so that the load was distributed uniformly over the entire length of the conduit.



5,000 Kw. Engine Driven Unit

On account of the elevation of the ground towards the east, it was decided to make the engine room floor at the street level towards the middle section of the building, so that in the first section of the building there would be no basement, the basement being on the ground level about six feet above high water.

It was decided to install as a unit generator the largest size to be obtained commercially, although at first a unit of one-half size was installed so as to operate eco-

nominically at the light loads during the period of the growth of the load on this section. For these reasons 5,000-Kw. units were decided upon as the standard, and 2,000-Kw. units were installed as the half unit. Both of these units have an overload capacity of 50 per cent. for two hours.

The General Electric generators are revolving field, two-phase, 6,000 volts, excitation being provided by motor generator sets. The motors, which are of the induction



Armature Frame 5,000 Kw. Generator

type, are wound for 6,000 volts, two-phase, the direct-current generator being wound for 300 volts.

A small steam exciter set is used in the event of the station being unable to obtain current from tie lines when starting up. These exciters are placed on the engine-room floor. On the first mezzanine floor are placed the direct-current switchboards for exciters, the oil switches, and the series and potential transformers. On the second mezzanine floor are the reserve oil switches, one of which is always in series with the switch on the floor below, and is also used as a selector switch for each of

the bus-bars, the bus-bars being arranged in separate concrete compartments on the upper mezzanine floors, and the controlling board being located on the second mezzanine floor.

The boiler-house building consists of an arrangement for double-decked boilers with coal storage above the boilers and a common ash floor for both floors of boilers. The basement or ground floor is arranged to receive all of the ashes, each boiler being provided with a cast-iron sectional ash pit, and connections can be made between the combustion chamber and the ash pit for the ready removal of refuse material. On the side adjoining the engine room is situated a pump room, in which are located the tank, pumps, boiler feed pumps and feed water heaters. The basement has a height of eighteen feet, which admits of the use of almost any type of auxiliary apparatus without crowding. The flues of the first boiler room floor also pass through the basement to connect with the chimney, thus leaving the boiler room clear of any obstructions.

In the first section of the building will be installed thirty-two boilers approximately 630 H. P. each. These are arranged in batteries of two, and are so set that all walls may be easily examined. The boilers are equipped with a complete double system of feed water supply, the first from the hot water feed water system, and the second by individual injectors for each boiler connected with tanks placed above the boilers—the injectors being intended for emergency use only. Special care has been given to the installation of the feed water piping, fittings being avoided whenever possible, and bent brass pipe used.

Coal is supplied by means of chutes arranged close to the columns, the spout being bent in order that the coal can be dumped on the centre of the floor should it be required.

The second boiler room is a duplicate of the first boiler room with the exception that the flues pass up and through the coal-bunker floor to reach openings in the stack, provided at this point.

The coal-bunker is divided into pockets, first, to admit of the flues passing across the building; and second, to prevent fire from being communicated from one portion of the coal-bunker to another, thus entirely obviating the danger from this cause. Should the coal ignite from any cause, the pocket could immediately be drained on either of the boiler-room floors.

Coal is delivered to the coal bunker by means of two bucket elevators at the end of the building and distrib-



Switchboard Alternating Current Substation

uted by two horizontal conveyors running above the coal-bunkers. The space between the coal-bunkers and the roof is provided with a liberal number of copper louvres so as to admit of ventilation. Each space above the flue-crossing is provided with a "Star" ventilator. All stairways are metal, and strict attention has been given to making the building as nearly fire-proof as practicable. All the doors between the engine room building and the boiler room building are standard Underwriter fire-proof doors.

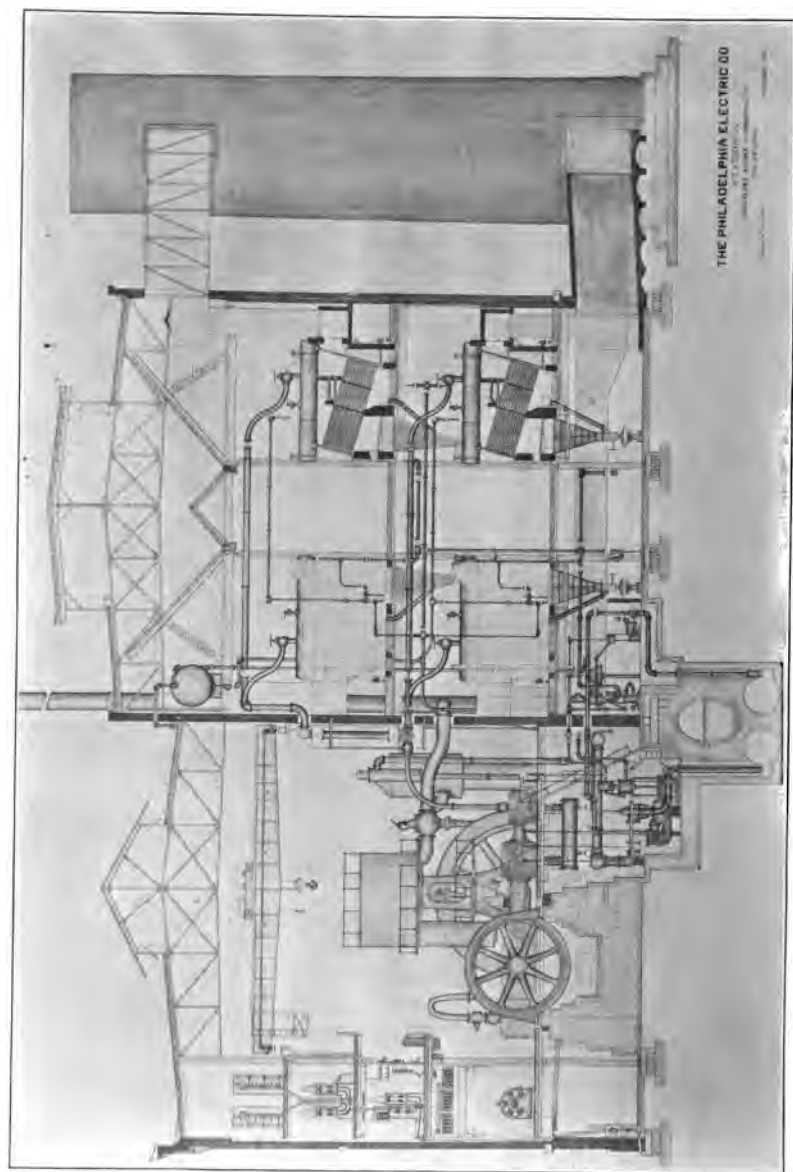
The engine room building, which fronts on Christian Street, is similar in external appearance to the boiler room building, both being built of red stretcher brick and the general design consisting of large panels arranged between the structural steel columns, this being an inexpensive but ornamental design. The panels in the boiler room building are partially bricked up and the engine room walls are almost entirely utilized for windows, making a very light engine room. The engine room is further provided with a lantern extending along the engine room proper. The lantern is laid with wired glass, the glass overhanging the removable ventilating sash, so that in the event of a heavy wind or rain storm it is not necessary to close the ventilating sash.

All of the metal work exposed to the weather is covered with sheet copper, including the cornices and rain spouts, it being the intention that the building is to be as permanent and lasting as possible. The engine building is lined with light-colored enameled brick to six feet above the engine floor, the other part being buff color.

The mezzanine floors are provided with heavy solid balustrades, which prevent material from dropping through, and would admit of these floors being enclosed should it be found desirable. The switchboard and all its appliances are arranged in the various mezzanine floors on the Christian Street side. The floors on the end facing the river are used for offices, storerooms, and executive purposes.

In the boiler-room the boilers are first arranged in batteries of two, and the batteries facing each other are connected to steam pipes which in turn feed the main header which is located on a division wall on the engine room side. This main header is arranged zigzag fashion; one section joins two batteries on one floor, rises and joins two batteries on the floor above. In this way the expansion and contraction of the main header is taken care of, and the line is always exposed to view. All joints are readily accessible, as permanent iron galleries are arranged parallel with the steam pipe.

The condensing apparatus is arranged on the boiler



Sectional Elevation of Main Generating Station

room side of the engine room and the auxiliaries are placed in the basement, this position making them adjacent to the auxiliaries for the boiler room, but separated from them by the division wall. They are, however, readily accessible on account of the doors placed for this purpose.

The 2,000-Kw. unit is driven by a cross double-tandem compound Wetherill-Corliss engine. The 5,000-Kw. unit is driven by a combined vertical and horizontal double-compound Reynolds-Corliss engine built by the Allis-Chalmers Company. The condenser for the 2,000 H. P. unit is of the jet type, and for the 5,000-Kw. unit is a Weiss injector condenser.

Special effort has been made to simplify the installation of the cables and electrical equipment and to keep the steam and electrical equipments entirely separate from each other, so that the steam pipes shall not cross the electrical conductors or vice versa. Cables immediately upon leaving the generators enter a terra cotta conduit and are conducted through continuous terra cotta conduits to the terminus. There are two sets of cables which should receive consideration, first, the cables running from and to the generators, and second, the feeder cables leaving the station.

The feeders are distributed along the entire length of the Christian Street side. These cables are arranged in groups of six, and enter separate manholes distributed along the street front of the building, so that there is no bunching of cables in any manhole. The first conduit laid consisted of twenty-four $3\frac{1}{2}$ -inch terra cotta conduits. Drawings were prepared showing the layout of each cable from the station to the substation. The manholes were designed specially so as to admit of easy access to the cables, and at the same time protect the cables in the event of either gas explosions in manholes or short circuits of adjacent cables. The manholes are of octagonal shape, and are provided with soapstone shelves which fulfill the function of supporting the cable and acting as a barrier, so that a short circuit in one cable cannot be communicated to its neighbor. The conduit is



Direct Current Generating Station

spread at the point of entering the manhole so as to bring the end of the duct in line with the shelf upon which the cable will rest. This prevents any sharp bends and admits of cables being installed in a safe and convenient manner.

The station terminal of the cable is on the ground floor and consists of a series of concrete cells, the cable being provided with a pot-head at this point and spreading from a three-conductor cable to single-conductor cable. In these compartments are placed single-pole disconnectors. These disconnectors are similar to knife-switches without handles, and arranged to be opened with a detachable rod. The object of these disconnectors is to enable the cable department to know that current is not thrown on the cable when out of service and under repairs. Immediately above these compartments are placed static discharge devices which consist of an arrangement of spark gaps and graphite resistances similar to lightning arresters. They are protected by means of a small enclosed fuse and are enclosed in cases to keep out the dust. From these compartments the cable enters a terra cotta conduit which passes through the engine-room wall, is then exposed to the first mezzanine floor, and enters the concrete compartments leading to the oil switches and to the transformers, both series and potential.

The arrangement of the switchboard is in three tiers. First, automatic switches, or what might be called the operating switches; second, the reserve switches, which are placed above on the bus-bars, which occupy the highest tier. The intermediate tier consists of two oil switches, one of which is connected to either bus-bar, so that at all times two oil switches are in series.

Connections to the bus-bars are made with disconnectors similar to those used in cable compartments on the ground floor, so that it is unnecessary to remove any bolts or fastenings to disconnect any line from the bus-bars or from the outgoing feeders. This arrangement also enables the generators to be connected to any point of the bus-bars, minimizing the amount of copper used

for that purpose. All of the switches are of the remote control type, an operating table being placed on the intermediate gallery.

The oil switches and high-tension bus-bars are all arranged in concrete and soapstone compartments. As each switch section is a unit, and practically all of the units are similar, the concrete type of construction permitted the same moulds being used for building up all of the compartments. The switches were set sufficiently high from the floor to enable easy access to the base of



Switchboard Direct Current Substation

the switch and prevent sharp bends of the cable. On the back of the switch compartments on the first gallery are arranged the transformer compartments, which are of similar concrete construction and separated by means of a concrete wall. Provision has been made to ventilate all of these compartments so that in the event of an arc being formed, the flame will pass out through the vents, striking the division wall, and cannot be communicated to any of the other compartments.

The transformer compartment contains two series transformers and one potential transformer. The cases and frames of all of the transformers are grounded with heavy copper strips laid in the concrete. This copper

strip is also connected to angle irons set in the concrete to which the various transformers are attached. One of the series transformers is used to operate the automatic switches by means of time limit relays, and the other furnishes current for various indicating and recording instruments.

The potential transformer is of 600 watts capacity and is large enough to supply all pilot lamps and all indicating and recording instruments required.

All of the secondary wires from these transformers and the low-tension direct circuit supplying the motors operating the oil switches are installed in iron armored conduit, so that there are no exposed wires, either high-tension or low-tension, in the switchboard construction. All of the concrete compartments are provided with fire-proof doors; and as the operating switchboard is entirely low-tension, being either the secondaries from the transformers or direct current supplying the operating motors, there is no danger from any cause to attendants, as in the event of failure and breaking down of the transformer the high-tension current is grounded through the strips provided for that purpose.

This table is arranged in steps similar to the keyboard of an organ so as more clearly to define the various groups of switches. Each feeder is controlled at this point by means of three switches, one automatic switch and two selector switches. These switches are provided with pilot lamps which indicate the position of the switch. The instruments are located on an instrument board immediately in front of the controlling table and upon this are mounted for each feeder a pilot lamp which indicates the number of the feeder, an ammeter and a recording wattmeter on each phase of the feeder. The generator control consists of the three switches. In this case all of the switches are hand-operated, no automatic switches being used on the generators. The main switch is controlled by a different type of handle to distinguish it from the selector switches. These are placed at the top of the table so as to be out of the way. On the next step is a switch to open the field circuit of the generator,

and the switch for varying the speed of the engine for synchronizing. The lower step contains the field rheostat and synchronizing plugs. On the front of the table are the switches controlling the exciter sets. The indicating instruments on each generator are pilot lamps, voltmeters, ammeters and indicating wattmeters.

The instrument board is arranged with generator instruments and exciter instruments parallel to the control table, and the feeders are arranged

on an offset at an angle of 45 degrees, which concentrates



Operating Table and Instrument Panel

the instruments and assists the vision of the operator as well as enabling him to differentiate between the different classes of instruments.

Current is distributed from this station by three conductor high tension cables installed in terra cotta conduits. These cables are principally paper insulated, protected by lead sheets. Special care has been used in the building of the subway, the maximum number of ducts used being twenty-four. The terra cotta ducts were laid on a concrete bed and the sides and top are protected by creosoted boards. At the manholes the conduits were spread in order to prevent bunching of the cables in the

manholes. The manholes were specially deesigned so as to receive cables on shelves, the manhole being octagonal in shape, allowing the cable being installed with a minimum amount of bending and a fixed location for each cable. Right angle bends were taken care of by building a special manhole, being a larger manhole with a division wall, making practically two manholes, each section having a cover. In the designing of the manhole caution was taken first in spreading the conduits at the points of entering the manhole, thus allowing the maximum space between the cables, arranging shelves of soapstone or terra cotta to carry the cable through the manhole and the cutting out of all the waste space so as to reduce the useless area of the manhole to a minimum, and in this way reduce the liability and danger of explosions. All of the unused conduits had their ends sealed to prevent accumulation of gas in them and in the manholes. The manholes, wherever practicable, are drained to sewer and in some cases to a gravel bed. The manholes were provided with asphalt filled covers with dripping lip and ventilating holes.



One of the Substations

Cables on entering the substations are carried in terra cotta conduits until they reach the final terminus.

In direct current substations high voltage, two-phase induction motors are used to drive direct current generators. These generators are usually for 250 or 300 volts, with one or two sets arranged for 125 or 150 volts so as to obtain the neutral for the three-wire system.

Batteries are also installed in the most important substations, which afford facilities for obtaining the neutral and very materially improves the reliability of the substation.

The high tension feeders at the substation end are distributed on the bus-bars of the substation so as to obtain a full load for each feeder, thus preventing the necessity for tying the feeders of the substation, reducing



Motor Generating Sets Direct Current Substation

the operating complications in the event of a defective feeder.

Step-down transformers are located in the substations. These transformers are supplied with dial switches arranged for variation of voltage of 14 per cent. on the secondary side. The feeders running from the substations to the centers of distribution are equipped with regulators on each phase arranged to be operated from the switchboard. At distributing and substations inspectors are on duty night and day at the call of consumers to take care of any complaints. A stock of lamps and sup-

plies are also maintained at these points. District offices are also located in a number of stations and substations, at which bills can be paid for current in any district; and a force of solicitors is on hand to take care of business requirements in that district.





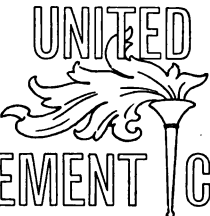
*THE UNITED GAS IMPROVE-
MENT COMPANY*



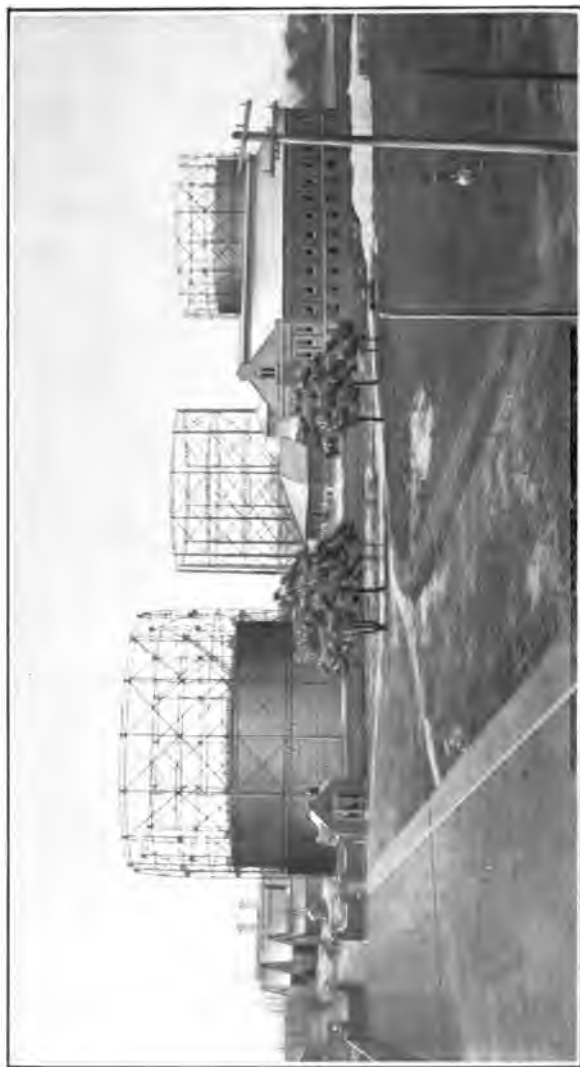
I. Office Building of The United Gas Improvement Company
Northwest Corner Broad and Arch Streets
Philadelphia

1890

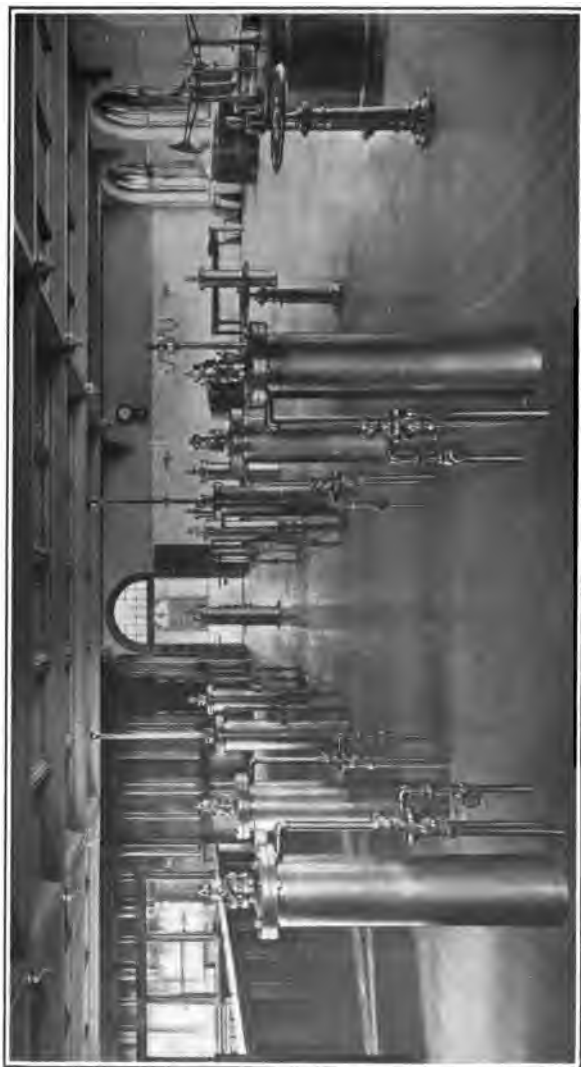
THE UNITED GAS IMPROVEMENT COMPANY



LIGHT, fuel and transportation are the three subjects with which The United Gas Improvement Company concerns itself. The company owns or operates the gas works in thirty cities and towns besides Philadelphia, although this city is its home, and the works here are the largest under its management. The original purpose of the company's incorporators was the manufacture and sale of apparatus for the generation of water gas, and for this purpose the corporation, under the name of United Gas Improvement Company, was chartered June 1, 1882, under the general laws of the State of Pennsylvania. In order to secure the introduction of this method of manufacturing gas, which in 1882 was comparatively new and untried, it became necessary to lease the plants of existing gas companies. It soon became evident that the scope of the business could be profitably enlarged by the purchase of the stocks of gas and electric light companies. A second charter was secured, and the stocks and bonds of United Gas Improvement Company exchanged for the stock and bonds of The United Gas Improvement Company. Under this charter the business has since been conducted. The operations of the company are distributed over a large part of the United States, and include, besides gas works, plants for electric lighting and operation of electric railways; street lighting; and the manufacture of the Lowe Water Gas Apparatus. The frontispiece of this article (Plate I.)



II. View of Point Breeze Gas Works, Philadelphia



III. Interior Point Breeze Valve House, Philadelphia

shows the company's official home at the northwest corner of Broad and Arch streets, Philadelphia. This 12-story office building was opened in 1899, and is occupied entirely by the United Gas Improvement Company.

The present article will be devoted to brief descriptions of three typical plants operated by the company,—a



IV. Gas Testing Station, Philadelphia

gas-manufacturing plant, a power station for an electric railway, and a substation furnishing current for both electric lighting and electric railway.

THE MANUFACTURE OF GAS

This important department of the company's operations is represented by three illustrations. The first (Plate II.) is a general view of the Point Breeze Gas Works, Philadelphia, a plant capable of manufacturing

about 30,000,000 cubic feet per day. Its equipment includes a complete outfit of coal and coke-handling machinery and machinery for unloading coal either from cars or boats, as well as its own locomotives for shifting



V. Manchester Street Power House, Providence

cars. All the valves controlling the flow of gas to and from the holders, together with the governors controlling the street pressure, are conveniently placed in the valve house shown in Plate III. A unique feature is the operation of the valves by the hydraulic cylinder shown in the illustration. In all respects, this plant is one of the best

equipped in the United States for economy of operation. Plate IV. shows the testing station, a neat structure located one mile from the works. The gas is here tested subject to the average conditions affecting its consumption in the districts supplied by the Point Breeze Works.

As contractors and builders of the Standard Double Superheater Lowe Water Gas Apparatus, The United Gas Improvement Company manufactures the greater part of all the water gas apparatus used in the United States.

The second plant named is the Manchester Street power station of the Rhode Island Company, Providence, R. I. (Plates V. and VI.) This is a 10,500-kw. power station, furnishing direct current for local consumption and alternating current for distant points. Its chief interest lies in the arrangement and details of the machinery and apparatus, and in the absolutely fireproof construction of the building. The latter is a steel-framed, fireproof structure, of red brick and granite, with concrete floors, cement roof, wire glass windows, etc. Not a piece of wood is exposed, and it is believed that the building is impervious to flames, whether of inside or outside origin. The interior is lofty, well-lighted and appropriately finished, the boiler room being unusually light and noteworthy for the longitudinal platforms and passageways, giving access to apparatus.

COAL HANDLING

Coal is ordinarily brought to the station by water, and is transferred to the coal bunker by means of a Hunt continuous bucket chain conveying system, passing through a crusher and a weighing hopper. The conveyor is electrically driven from a 15 horse-power motor and is utilized also to carry ashes. The coal storage bin has a capacity of 3,000 tons, or fifteen days' supply at the maximum load. From the bottom of the bin a chute is taken for each boiler, each chute ending in a gate valve from which coal can be delivered at will into a measuring chute.



VI. Interior Manchester Street Power House, Providence

BOILERS AND ECONOMIZERS

The boiler plant comprises sixteen 515 horse-power Babcock & Wilcox water tube boilers, arranged in four batteries on each deck, two boilers per battery. Each boiler has 5,159 square feet of heating surface, with 252 tubes 4 inches in diameter and 18 feet long, arranged 21 sections wide and 12 tubes high. Each boiler has also three 36-inch steam and water drums, and in addition the boilers are provided with superheaters and superheat the steam 150 degrees Fahrenheit.

The products of combustion are carried off by natural draft, but economizers are employed, of the Green pattern, arranged in an interesting manner according to the so-called unit system, one for each battery of boilers.

STEAM PIPING

The high pressure steam piping from the two decks of boilers is all brought to one steam header, which is noteworthy from the fact that though nearly 160 feet long, it is provided with but two valves. The steam pipe from each boiler is ten inches in diameter, and the two pipes from the boilers vertically in line are united in a special connection before joining into the header. The usual long radius bends are employed in the pipes to and from the header, and the gate valves are placed in them in the boiler room.

Wherever possible, provided there is no chance of receiving oil, the condensation in the high pressure lines is returned to the boilers by means of the Holly gravity return system. In that connection an alarm whistle set against the partition wall in the engine room is connected to blow should the system fail to act, allowing water to accumulate. On each side of the whistle is a brass hand-wheel; if the alarm is given, one is turned on to cut out the regular connections and the other turned on to blow off the water and prevent its reaching the engine cylinders in any way.

The steam pipes to the main units enter the room through the partition wall, and immediately within the

engine room each is tapped for the supply of the corresponding condenser air pump, and in the case of the horizontal units also for a line steam pipe by which high pressure steam can be delivered to the receiver when necessary and in one instance also for the steam driven exciter. With regard to the subdivision of the high pressure steam header, it will be seen that by the location of the two valves provided in it, the centre section of the header can supply one direct current and one alternating current machine, if either end has to be cut out, and similarly in the event of an accident to the centre section or to the boilers connected thereto, an alternating unit can be run from the end of the header and the direct current supply can be maintained from the other, pending repairs.

GENERATING UNITS

The engine room will contain, when completed, five direct-connected units, two with horizontal and three with vertical engines, and all cross-compound. The horizontal units are Filer & Stowell engines, 32 and 64 by 54 inches in cylinder size, with General Electric generators, two giving an alternating current output of 1,500 kilowatts at rated load and the other a direct-current output of 1,600 kilowatts. The vertical unit consists of a Westinghouse engine, of 42 and 86-inch cylinders with 60-inch stroke, and a General Electric railway unit of 2,500 kilowatts capacity. The alternators are operated at about 94 revolutions per minute and give current in three phases at 25 cycles and 11,000 volts, and the engines, which it may be noted are operated with automatic cut-off for both cylinders, are equipped with a $\frac{1}{8}$ horse-power Browning motor, by which the generators are brought into synchronism by controlling the engine governors from the switchboard. The present horizontal railway unit runs at 90 revolutions and the vertical unit at 75 revolutions. The steam pressure is 150 pounds and the vacuum normally 26 inches. For the alternators there are two motor-driven and one steam-exciter unit, the last for use when no alternating current is available, as

the motor generators employ induction motors. The steam unit is a General Electric marine set with an 11 by 8-inch engine and a 30-kilowatt, 125-volt dynamo, while the other consists of 440-volt, 75 horse-power motors and 125-volt, 55-kilowatt dynamos, each set capable of exciting both alternators.

CONDENSERS

The condensing plant utilizes salt water from the Providence River, and consists of four jet condensers, one for each unit, with vertical twin pumps drawing from one and discharging into a second of two concrete conduits extending lengthwise of the building under the basement floor.

BOILER FEED SYSTEM

The boiler feed system is one of the specially interesting features of the plant. Owing to the use of jet condensers operated with salt water, fresh water for the boilers is constantly required, being taken from the city mains through one or both of two 6-inch pipes. Normally, the water is passed through feed water heaters to which is brought the exhaust steam from the feed and condenser pumps and the marine-type exciter set, and is then taken by the feed pumps, at a temperature of about 170 degrees Fahrenheit, so that the pumps thus handle hot water, and is delivered through the economizers into the boilers at a temperature of 220 to 230 degrees. The heaters, pumps and economizers are all provided with by-passes, and there are also duplicate feed mains to the boilers.

ELECTRICAL APPARATUS

The handling of current at 11,000 volts has resulted in an interesting equipment of electrical apparatus grouped around a two-gallery switchboard, thirty-one feet above the engine room floor. The various electrical conductors from the generators are carried overhead on the under side of the ceiling in a spacious, well-lighted gangway in the basement. Here the high-tension bus

bars are located, each enclosed in separate housings supported on a slate platform, and connections to and from them are made in oil-break brick-housed switches on the engine room floor. These are of the pattern operated by relay switches on the switchboard, the switches actuating the main switches through worm and wheel gearing driven by small direct-current motors, one mounted on the brick enclosure of each switch. There are five alternating-current feeders and the conductors pass out of the building opposite the second story of the switchboard where there are cut-out copper bar switches mounted on marble panels, with branches to the lightning arresters, grouped underneath the first gallery.

A feature of the switchboard construction is the provision of $3\frac{1}{2}$ -inch pipe conduits built in pilasters against the outside building wall for the passage of the conductors. At the bottoms the pipes are set into special cast iron sockets giving smooth rounded surfaces into the conduit and at the top they are fitted into the marble cap of the pilasters. The high-tension feeders are carried horizontally through the building wall in the centre of an 8 by 8-inch opening in it, and outside, under the cover of heavy slate hoods, are located the tension insulators, and the beginning of the transmission line.

The alternating current feeder panels have each a recording wattmeter and three ammeters, the latter showing the state of balance of the load on each phase. The generator panels have only one alternating current ammeter, but have both an indicating and recording wattmeter, together with an ammeter for field current. For the motors of the electric-driven exciters, there are two banks of three delta-connected transformers on the slate platform in the basement. These step down to 460 volts and the motor panel of the switchboard contains the relay switches for cutting in and out the high-tension current of the transformers, the switches being the motor-operated oil-break type.

The direct-current board at present provides for thirty feeders in fifteen panels. Each panel carries two ammeters for the two feeders, but only one circuit

breaker. The generator panels have one switch on the switchboard in the negative side, and one circuit breaker in the negative side, while on a pedestal at each machine there is a positive switch and the equalizing switch. The total direct-current output is measured in a large recording wattmeter on a panel between generator and feeder panels, and this panel also carries a totalizing indicating ammeter. The positive feeders are 500,000 circular mils and the negative returns 1,000,000 circular mils. The switchboards are, generally speaking, equipped with standard General Electric instruments; they are of Vermont marble, two inches thick, mounted on 3-inch longitudinal timber stringers. The switchboard structure is of steel framing with slate floors.

OPERATING DETAILS

The plant is equipped with an interesting oiling system, and is piped for compressed air throughout engine and boiler rooms. A large clock on the partition wall is set to strike a gong every twenty minutes, when the oilers are required to make a circuit of the engine room to ascertain the condition of all bearings, and once a day the machinery is cleaned by compressed air. For the latter, there is a Westinghouse locomotive type compressor, automatically controlled to maintain 70 pounds pressure, and the system distributes from an air reservoir about 18 inches in diameter and 7 feet long. For signalling between operating engineer and switchboard attendant, the system in vogue on shipboard is in use, consisting of two dials, one in the switchboard gallery and the other on the engine room floor, these connected together with chains and actuating pointers to stop opposite various legends on the dials to which attention is drawn by the ringing of a gong.

The last plant mentioned is the Waterbury substation of the Connecticut Railway & Lighting Company. This company has recently arranged to utilize in its Waterbury and New Britain districts current transmitted from the water-power station of the New Milford Power Com-



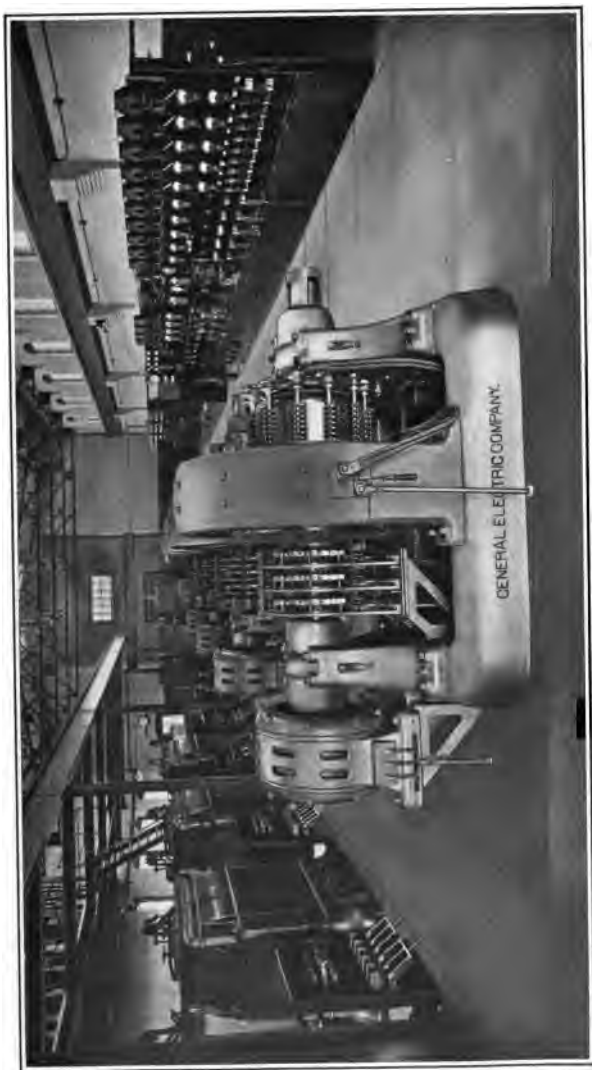
VII. Waterbury Substation, No. 1

pany, which is located at Gaylordsville, Conn., on the Housatonic River.

This station generates 3-phase, 60-cycle current which is transmitted over two 3-phase lines at 33,000 volts to Waterbury, New Britain and Cheshire, at which places substations have been erected and the necessary apparatus installed for utilizing the current so transmitted. The distance from the power station at New Milford to Waterbury is about 30 miles; from the water-power station to the Cheshire substation, about 35 miles; from the water-power station to New Britain, about 50 miles.

The line is run in duplicate from the power plant through Waterbury and on to New Britain with a branch consisting of a single 3-phase circuit "taken off" the New Britain line at Milldale and run to Cheshire.

The current is to be utilized for the entire commercial and municipal lighting and power in Waterbury and New Britain and for the railway service in these cities and Cheshire and the adjacent territory. The greater portion of the power will be used in Waterbury. For the utilization of this power there have been erected two substations in Waterbury. The larger one, known as No. 1 (Plates VII., VIII., and IX.), is located on the outskirts of the town and the duplicate high-tension lines terminate at this substation. The line to New Britain continues on from this substation, the high-tension automatic controlling switches being located in this substation to enable this line to New Britain to be controlled at this point. Careful attention has been given to the design and construction of this substation. The building is of steel and brick construction with concrete floors and cement roof laid on steel trusses. The high-tension wires are led into the building through the side wall, the lightning arrester equipments being located in a gallery above the main operating floor. From thence the high-tension wires are led down to a high-tension bus bar chamber which extends along one side the entire length of the building and contains a double set of 3-phase, 33,000-volt bus bars. Knife blade connecting switches are installed



VIII. Interior Waterbury Substation, No. 1

so that either one of the high-tension lines can be connected to either of these two sets of high-tension busses.

Above this high-tension bus bar chamber on the operating floor are located the static step-down transformers, which are of the air-cooled type, the bus bar chamber being also the air chamber into which the circulating air is forced to cool the transformers.

On the operating floor are located four 500-kw., 550-volt, 60-cycle railway rotaries, each one with its individual 3-phase static transformer and individual type H automatic oil switch on the 33,000-volt side. There are also installed six 500-kw. static transformers stepping down from 33,000 volts to 2,300 volts, which is the voltage used for distribution on the alternating current lighting and power service.

The station contains also four 100-light constant current transformers, used for the city arc lights, these transformers being supplied from the 2,300-volt bus.

The controlling switchboards for the railway, lighting and power services are located alongside of the operating room opposite to the high-tension lightning arresters. The basement under the operating floor is large and airy so that ample space is provided in it for all wiring and switchboard apparatus which can be more conveniently located under the floor. Distributing feeders from the switchboard are carried in lead cables through conduits to the wire tower located at one corner of the building, where racks are installed, enabling these feeders to be carried out in a systematic manner and without crosses.

A storage battery for the railway service is located in a room adjoining the main substation. This battery is installed for regulating purposes, so as to take up the peaks of the railway load and lessen their effect as a disturbing element on the lighting load run in conjunction with it.

The railway feeders for the Waterbury district are distributed directly from this substation, as are also the municipal lighting circuits and the circuits for the alternating current lighting and power.



IX. Interior of Substation No. 1, Waterbury

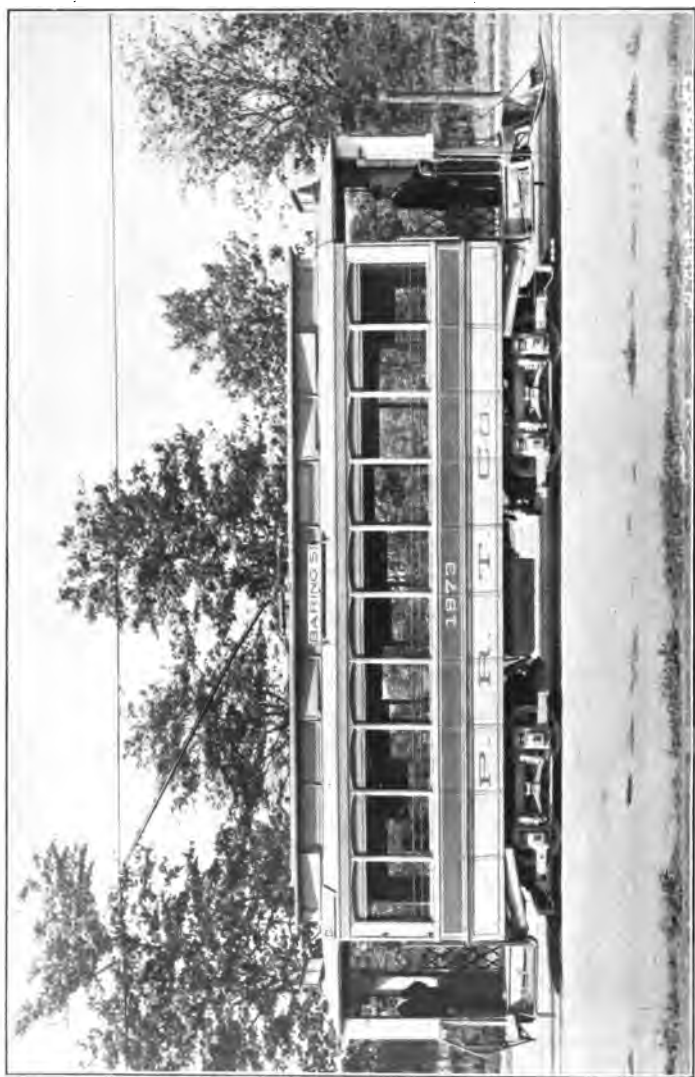
The particular part of the commercial lighting in Waterbury is done on the Edison 3-wire, 220-volt system, and to supply this system there is located in the centre of Waterbury, about a mile from Waterbury substation No. 1, substation No. 2, utilized entirely for this Edison service. This station is supplied by means of two 3-phase overhead 2,300-volt feeders which run from the 2,300-volt bus bar in Waterbury substation No. 1.

In this Waterbury substation No. 2 are located at present four 300-kw., 300-volt rotaries for the Edison service. Static transformers supplying these rotaries are of the air blast type. The building containing them is also of thoroughly fire-proof construction, being constructed of brick with cement roof on steel trusses and with concrete floors.

The New Britain and Cheshire substations follow in general the same design as Waterbury substation No. 1, except that the Cheshire station supplies railway service only, and therefore contains only railway rotaries. There are located in this Cheshire substation at present three 300-kw., 500-volt, 60-cycle rotaries. There is also adjoining this station a storage battery.

The New Britain substation contains three 300-kw. railway rotaries with a storage battery for the railway service, and three 500-kw. static transformers for supplying 2,300-volt, 3-phase current for the lighting and power service, which, in New Britain, will be entirely alternating current.

*THE RAPID TRANSIT COM-
PANY*



Type of Car Used Exclusively by the Philadelphia Rapid Transit Company on Most of its Out-reaching Roads

THE RAPID TRANSIT COMPANY



IT is a recognized fact that the comfort, prosperity and health enjoyed by the inhabitants of a city are dependent to a large degree upon the facilities provided for local transit within its borders. In no other city in the world is this truism better illustrated than in Philadelphia. The wonderful changes which have taken place here within recent years are all directly related to a system of street car service which has no superior in any other community. It is within the memory of most citizens that the urban travel of the city was, not so long since, a matter entrusted to a considerable number of detached companies operating small and dingy horse cars, moving over defective trackage, existing within a limited area.

The adoption of electric motive power was but the beginning of a new order of things. It still remained to unite these various conflicting interests and centralize the authority in a single strong and responsible corporation imbued with a full appreciation of the needs of a rapidly growing population and the possibilities of the future. This having been done the work of effecting betterments and extensions of existing lines and creation of new routes has been uninterrupted.

ENCOURAGES REAL ESTATE EXTENSIONS

The province of the modern street car corporation is to not only provide for the ordinary daily traffic but, as well, to lead beyond the borders of the built up city and thus encourage the spread of new suburbs; to bring country and city more closely together. Also to stimulate the general traffic upon suburban lines by the maintenance of attractive and costly amusement parks wherein the masses may, during the summer and autumn seasons, find delightful recreation at an outlay represented by the car fares only.

It is the policy of such a company to adopt and install all devices and improvements which tend to the further comfort of its patrons, rapid service and economy of work. These things have all been accomplished by the Rapid Transit Company in Philadelphia.

At the present time this company operates some 1,600 cars upon 550 miles of track, carrying in the aggregate one million one hundred thousand people daily. The annual receipts reach about \$16,000,000, figures which amply attest the magnitude of the work performed and results attained.

The lines maintained throughout the city occupy nearly all of its important highways and radiate therefrom in every direction to the outer districts which have become in recent years the favorite residential sections for a large and increasing proportion of the people.

At a great number of intersecting points transfers are issued under the original fare (five cents) or exchange tickets become valid at eight cents. These enable the passenger to utilize cars running in diverse directions and thus very generally reach places in parts of the city distant from the starting point by payment of a single fare, or, at most, three cents additional. It is a fact that in no other city can the people make such extended trolley trips for one fare as in Philadelphia.

LONG AND PLEASANT RIDES FOR SINGLE FARE

Philadelphia, including within its limits 129 square miles of territory penetrated everywhere by the tracks of the Rapid Transit Company, affords to the average resident speedy transfer between residence and place of occupation at a cost, when the mileage is taken into account, which is lower than that charged in any other city. As an instance in point, a resident in the southern section of the city may ride for five cents and in the same car to Chestnut Hill, a distance of thirteen miles, and to Foxchase, a distance almost as great. Both of these rides extend through beautiful sections of the city, and give the visitor an opportunity to view some of its most beautiful residential spots.

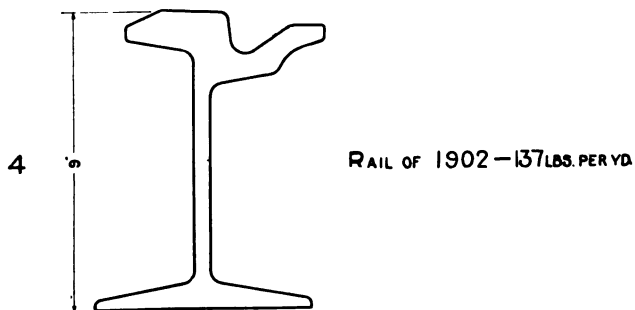
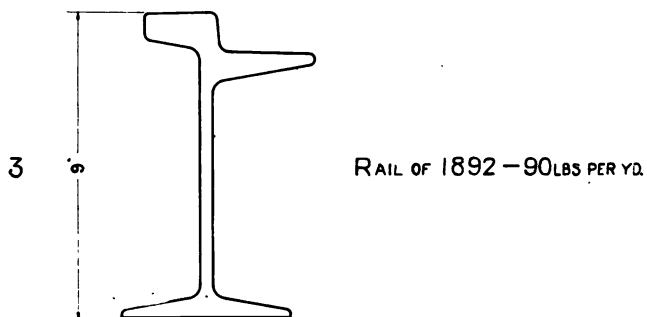
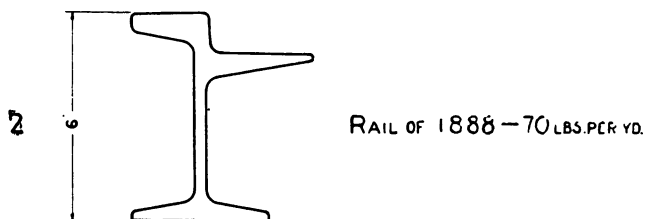
ROLLING STOCK IMPROVEMENT

One of the most difficult problems confronting a great local carrying company is that of providing adequate accommodation for not only a population constantly growing and spreading and which makes an increasing use of the cars per capita, but which moves in such vast multitudes at morning and evening between workshop and home.

While electricity has made it possible to meet these conditions and to provide for the future it has also entailed the annual expenditure of added millions of dollars in the maintenance of the roads, and the permanent investment of vast sums in the reconstruction of tracks, the purchase of larger and better cars and the erection of power houses equipped with the most intricate and costly types of machinery.

In addition to the original cost of tracks and their repair, it is obligatory upon the Rapid Transit Company to pave and keep in repair the general surfaces of the streets which it occupies.

In the era of the horse car, a flat track was spiked upon long timbers which became in time decayed from use, and there are thousands of people still in



Styles of Tracks Representing the Evolution in Street Railway Rails from 1856 to 1902, Showing the Latest Improved Rail now being Placed upon many Lines of the Philadelphia Rapid Transit Company

the prime of life who may recall, with little pleasure the constant discomforts and delay inseparable from the old system.

The street car rail has undergone a most radical change from its form at the time when horse cars were the only means of street railway traffic. The first cut shows the first rail that was laid in Philadelphia. It was a flat iron rail placed upon wooden stringers and easily got out of repair. This rail weighed but 47 pounds to the running yard. In 1888 a rail almost double the weight and resembling the letter "T" replaced the old style which had been in use so many years. The new rail was a radical departure from that formerly used and was six inches in height. It was placed upon wooden girders and weighed 70 pounds to the running yard, or nearly twice as much as its predecessor. It only required, however, four years for further improvement. In 1892 a rail weighing 90 pounds per yard and standing nine inches high replaced the two former types, where old tracks were taken up and new ones laid. Again in 1902 another advance was made in the improvement of rail. A most substantial improvement known as the "Trilby" rail, weighing 137 pounds per yard and the same height as the 1892 rail, was placed upon many of the streets where heavy traffic demanded more substantial rails than those previously used. The "Trilby" rail is the latest invention and has proven highly successful wherever adopted. While this rail is extremely expensive, it has nevertheless been substituted on many streets throughout the city, and has given entire satisfaction.

In these days the laying of street railway tracks has been practically revolutionized. After the old rails and ties are removed, longitudinal trenches 18 inches wide by 20 inches deep are dug and temporary ties about ten feet apart are placed across them. These ties consist of six foot long channels, to which short wooden planks are fastened by means of lag screws. The channels have at each end two di-



Track Car : the Largest ever Built. It is 72 feet long and Capable of Transporting 50 Tons of Rail over the City at a Time
By the Use of this Car the City Streets are Protected from the Use of Heavy Trucks

agonally spaced holes of a bulb shape. The distance between the two pair of holes is such, that when the rails are bolted to the channels by means of cast iron clamps, they are practically to gauge. The rails are primarily laid on the ties between the two longitudinal trenches, and the joints formed, after which the rails are moved out towards the ends of the ties, and clamped to them by the clips. The cast iron chairs are clamped to the base of the rails at inter-



View Showing Track Car Turning around a Corner of Two
Thirty-four ft. Streets

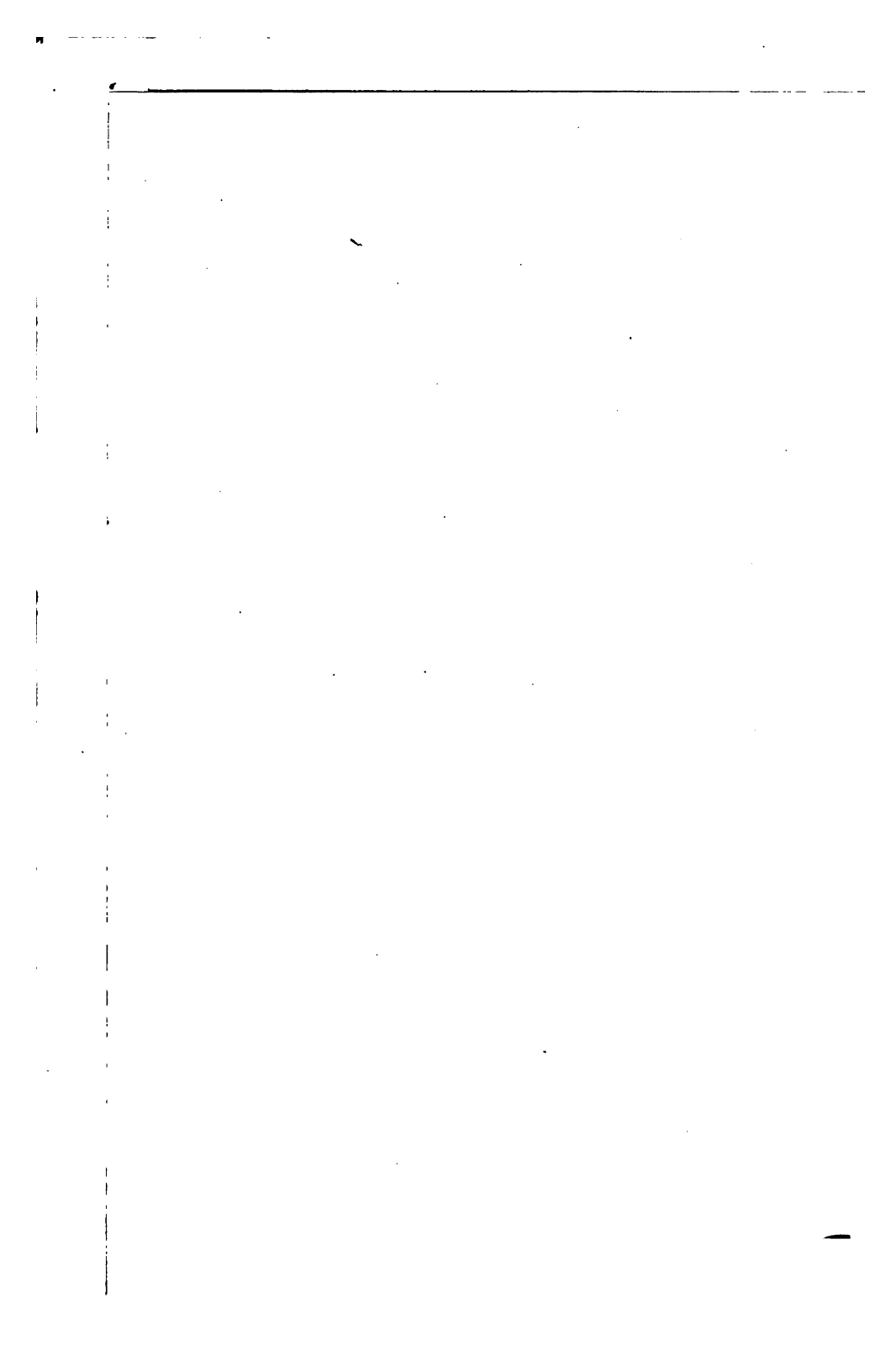
vals of five feet, they thus being suspended in the trenches. U shaped round iron rods with the short U legs downward, are also tied on to the base of the rail. These are for the purpose of holding the concrete stringers against the possibility of spreading. The wooden parts of the ties, which come between the trenches, are then tamped so as to bring the track to a practically permanent line, and an absolutely permanent surface. The trenches are then filled in with coarse concrete to within about $1\frac{1}{2}$ inches of the base of the rail, and the rail tamped with a finer concrete and allowed to set for several

hours, so as to permit the chairs to sustain the rails. The temporary clips are then taken off, and the ties removed. The cast iron chairs have two sets of bolts, one set of two vertical bolts that pass through the permanent clips, which hold the rails down on the road bed. The other set of two bolts press against the clips in a horizontal direction, and are



Electric Riveter Fastening Rails together

for the final adjustment of the rails to gauge and line. Before the chairs are attached to the rails, shims of about 1-16 inch thick steel are placed between them and the base of the rail. This is done for the following purpose: As the concrete shrinks slightly in setting, when these shims are removed and the vertical bolts are tightened, it insures a thorough and continuous support for the base of the rails. A solid sheet of concrete is now filled in be-





Showing the New Steel Bridge over the Schuylkill River, and the Incline to the Elevated Tracks which Extend from This Point Four Miles. To the Left is the Present Market Street Bridge.



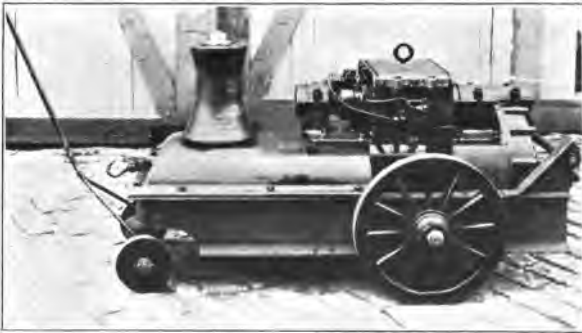
River, which will carry the Train-Cars as they Emerge from the Subway, over an
 m Thirtieth Street—Schuylkill River—to the County Line, a Distance of nearly
 feet Bridge, which will Carry the Present Surface Road Cars

1

tween the two rails, and for about two feet outside of the rails, to form a permanent foundation for the paving. Concrete is also placed between the webs of the rails and the paving.

MARKET STREET SUBWAY

When this company was inaugurated, every means known to facilitate rapid transit was resorted to. Cost was merely a minor consideration, as a proof of this the company has undertaken the construction of an underground railway on Market street, east of the Schuylkill river to the Delaware river,



Electric Winch for Drawing Cable through Conduit

with an elevated railroad on Market street west of the River Schuylkill to the county line. This will give Philadelphia its first real experience with rapid transit. It is the most important piece of work which the Rapid Transit Company has projected to the present time. Rapid progress is now being made with this work. The four track sections between the City Hall and the west side of the Schuylkill river is at present well under way. The piers for the new bridge crossing the Schuylkill river are expected to be completed by September 1st. The superstructure of this bridge will be erected almost absolutely of steel and will be substantial in every respect. It will



Showing Interior Tunnels in Course of Construction in the Subway, under Market Street, East of the Schuylkill River

contain four tracks; the inside tracks connecting with the elevated structure on Market street west of the Schuylkill river, while the remaining two tracks will be utilized for diverging the cars into the tunnel, where it begins to descend beneath the ground at Twenty-third and Market streets.

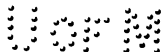
The subway portion of this work will be of the most solid construction. It will be built entirely of steel and will be well lighted and ventilated. The system throughout will be provided with comfortable stations. These are to be large enough for the accommodation of the thousands who will use the road. The stations will be easy of access and so arranged as to avoid any danger of congestion during the rush hours of the night and morning. The portal of the subway is now being finished just west of Twenty-third street.

The building of this subway involves the entire reconstruction of the sewerage system of Market street, and when the work is completed, Market street will have the best and most modern sewers located at as low a level as is practical to build them.

MARKET STREET ELEVATED

The elevated road at Market street west of the Schuylkill river will pass under the new elevated freight line of the Pennsylvania Railroad at Thirty-second street. A large and conveniently arranged station will be located at Thirty-second street, opposite the West Philadelphia station of the Pennsylvania Railroad. Work on the piers for the elevated railroad will be started in a short time, and it is expected to have the elevated portion completed by the middle of next summer.

This is but a mere outline of the work accomplished and in hand by the Philadelphia Rapid Transit Company. Its aim is to give Philadelphia a street railway unparalleled by no other city, and it is not amiss to say, that the work already begun and



that completed, is sufficient evidence of itself to prove the accuracy of this statement.

THE EMPLOYER OF THOUSANDS

The Rapid Transit Company is among the largest employers of labor in the city, the average number of men in its service being about 10,000. Applicants are selected with strict reference to intelligence and aptitude for the often trying and difficult duties, peculiar to service upon the cars. The operative offices of the company are at Eighth and Dauphin streets.

The executive officers of the company are: Mr. John B. Parsons, president; Mr. George D. Widener, first vice-president; Mr. Charles O. Kruger, second vice-president and general manager; Mr. Alexander Rennick, third vice-president; Mr. Robert B. Selfridge, secretary and treasurer.

The Philadelphia Rapid Transit Company as at present constituted, operates practically all the lines of cars in Philadelphia. It is a successor to the Union Traction Company, which prior to the organization of the Rapid Transit Company controlled the greater portion of the street car railways in this city. At the time the Union Traction Company was organized there were four systems in operation in this city. They were the Philadelphia Traction, the Electric Traction, the People's Traction, and the Hestonville systems. Under the former the following lines were controlled: Catharine & Bainbridge Sts. Rw. Co., Continental Passenger Rw. Co., Empire Passenger Rw. Co., Philadelphia & Darby Rw. Co., Philadelphia City Passenger Rw. Co., Philadelphia & Gray's Ferry Passenger Rw. Co., Ridge Ave. Passenger Rw. Co., Schuylkill River Passenger Rw. Co., Seventeenth & Nineteenth Sts. Passenger Rw. Co., Thirteenth & Fifteenth Sts. Passenger Rw. Co., Twenty-second St. & Allegheny Ave. Passenger Rw. Co., Union Passenger Rw. Co., West Philadelphia Passenger Rw. Co.

The Electric Traction Company controlled the

Frankford & Southwark Passenger Rw. Co., Citizens' Passenger Rw. Co., Lehigh Ave. Rw. Co., Lombard & South Sts. Rw. Co., West End Passenger Rw. Co., Second & Third Sts. Rw. Co.

The People's Traction Co. was composed of the People's Passenger Rw. Co., Continental Passenger Rw. Co., Chelton Ave. Passenger Rw. Co., Germantown Passenger Rw. Co., Girard Ave. Passenger Rw. Co., Green & Coates Sts. Passenger Rw. Co., Hillcrest Ave. Passenger Rw. Co., Northern Passenger Rw. Co., Phila., Cheltenham & Jenkintown Rw. Co.

The Hestonville System had in their control only the Hestonville, Mantua & Fairmount Rw. Co., Fairmount Park & Haddington Passenger Rw. Co.

The Philadelphia Rapid Transit Company now controls, under a single management, all of the above mentioned companies, together with several inter-urban roads reaching out into beautiful and historical hamlets.

POWER EQUIPMENT

The power equipment of this company consists of eleven generating stations and eight substations. The power stations have a generating capacity installed of 35,150 kw. for direct current and 2,000 kw. for alternating current, with 6,000-kw. alternating-current generators in process of installation, making a total equipment of 43,150 kw. There are six storage batteries in use with a total capacity of 5,200 ampere hours, and six 500-kilowatt rotary converters. With the exception of one station, now building, which is being equipped with alternating current generators and steam turbines, these stations are equipped with direct-current generators mostly direct connected with slow speed engines.

A few high speed engines are in use. The boilers are mostly of the water-tube type, made by the Babcock & Wilcox Co., Thayer & Co., and Parker Engine Co. Four of the stations were originally designed to run non-condensing and seven to run condensing



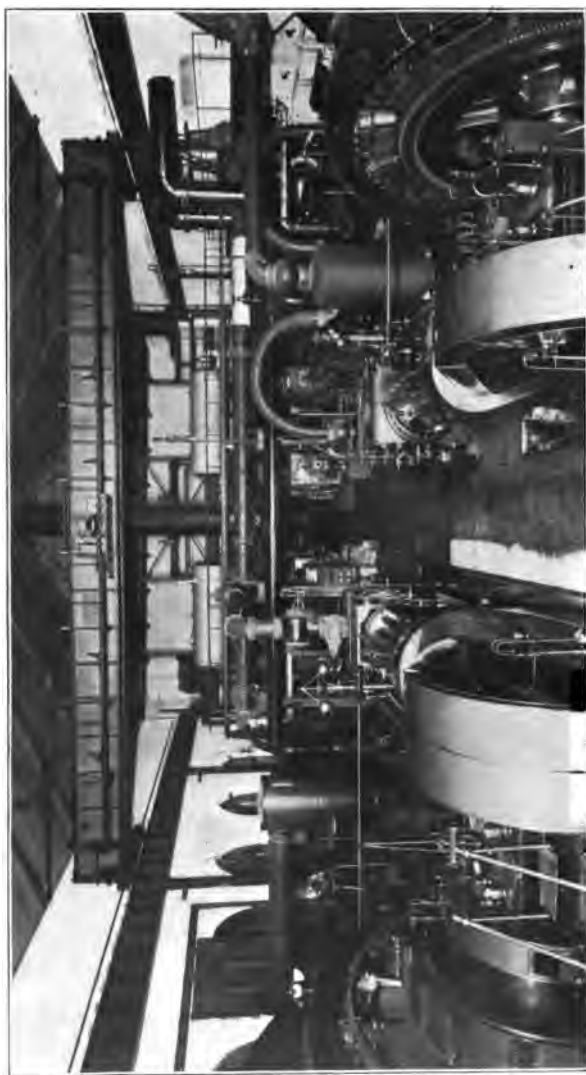
Of the four non-condensing stations, two have been changed to condensing by installing water cooling devices. Of these the most interesting is located at Thirty-third and Market streets. This station contains four 1,500-kw. and two 800-kw. generators, all direct current. Two of the larger engines are twin tandem compound, made by Robert Wetherill & Co. The other two larger engines are cross compound and



The Great Power House at Thirteenth and Mt. Vernon Streets

the two smaller engines are tandem compound, all four being made by the Pennsylvania Iron Works of this city.

The exhaust is led to three surface condensers. No attempt is being made, at present, to use the condensed water. Water for condensing is taken from the city mains. After passing through the condensers as much as is needed for boiler feed is taken to the feed water heaters at an average temperature of about 120 degrees Fahrenheit; the balance is forced to cool-



Interior View of Power House at Thirty-third and Market Streets

W. H. U.

ing towers, located on top of boiler room roof. Centrifugal pumps, driven by De Laval steam turbines, are used for circulating the condensing water. The boiler room is equipped with nineteen boilers having a total capacity of 7,300 horse-power. Each boiler is equipped with a steam blower. The coal is delivered by wagons and dumped into a hopper and conveyed



Sub-office Station of the Philadelphia Rapid Transit Company
on Germantown Avenue near Erie Avenue

by machinery to a tank over the boilers holding 1,600 tons. From the tank it is spouted to the boiler room floor. All firing is done by hand. The ashes are dumped into hoppers immediately below the boilers, whence they are taken by cars to an automatic hoist and dumped into elevated ash pockets. The switch-board is double decked, all the generator panels being on the first and engine room floor. The feeder panels are all on the upper deck.

The instruments are mounted on Tennessee marble and the board is equipped with double bus-bars

of aluminum. Each generator is provided with a wattmeter, as are also the circuits supplying light and power about the station.

LINES AND CABLES

The operation of a vast sytem like the Philadelphia Rapid Transit Company requires the installa-



Emergency Wagon in Operation

tion of miles and miles of lines and cable, so vast is the use of these commodities that an independent department has been organized under the caption of "lines and cables." This department has absolute charge of the construction and maintenance of underground and over head wires, including the telephone systems in use by the Company. For the safe operation of the system 644 miles of underground feeder cables are maintained; 176 miles of under-

ground return cables; 61 miles of underground telephone cables; 433 miles of trolley wire; 156 miles overhead feeder cables and 24 miles of overhead telephone wires. Within the city the company maintains 29,248 steel and iron poles over which these cables and telephone wires are maintained both overhead and under ground. Along these miles of wire pole box telephones are placed at convenient locations so that they can be used for emergency cases in the case of fire or accidents; there are 89 of these pole box instruments. The individual telephone system of the company consists of 263 of the latest improved telephone boxes.

PRINTING DEPARTMENT

So vast is the printing of the Company that it has and maintains its own printing establishment on Ninth street, above Dauphin street, in close proximity to the general offices at Eighth and Dauphin streets. This department is equipped with the most modern printing machinery and the very latest devices for printing all stationary, including tickets, exchange tickets, and other printing matter pertaining to the successful operation of the company. The plant has been equipped with the best presses obtainable, and all of the advertising matter pertaining to the Company and Willow Grove Park and its various connections are done under this roof and more successfully than could be done elsewhere.

BEAUTIFUL HOMES SUPERSEDE HOVELS

Prior to the introduction of the existing transit system the home sections even of the wealthy classes were nearly altogether situate within the space between the Delaware and Schuylkill rivers. Those resident in such sections as Germantown travelled chiefly by the local service of the steam rail lines. Sections dependent formerly upon horse car lines reaching to the suburbs had scant favor with home seekers. Open fields and unkempt collections of

hovels spread everywhere upon areas now covered with square miles of attractive semi-rural residences, the demand for which, both in sales and rentals, has thus far kept in advance of the ability of builders to complete them and of the city to place sewerage and lighting. The cordon of beautiful neighborhoods thus created within the city limits, affording thousands of families a more healthful and enjoyable existence, forms one of the crowning glories of this great city of homes. Nowhere else in the world do the people of moderate means, the wage earners in stores and factories, live with such comfort within their means, or enjoy such quick transfer by car upon their morning and evening rides.

Briefly stated the electric railway system here, as in many other cities, has accomplished the reversal of the pressure of population from an inward to an outward tendency, lowering the rental charges of old sections and thus doing much toward mitigating the evils of congested slum districts and their attendant crime and misery.

At the present time extensions are being laid in several outer districts through territory yet unpeopled and in nearly every instance these suburban lines connect with electric railways which traverse all of the picturesque and fertile country for many miles, knitting more closely than heretofore hundreds of charming villages and smaller cities closely to the vast centre of Philadelphia, immeasurably enhancing the value of land and stimulating retail trade with city stores.

These rural arteries thus offer a delightful and varied system of tours extending through eastern Pennsylvania from the romantic vales of Delaware county to the rugged fastnesses of the upper Delaware river and by ferry connection with Camden, across the Delaware river to a wide territory in Central and Western New Jersey.

The people are rapidly discovering these opportunities for cheap and novel excursions into the



Scene on Old York Road where Cars Wind around Old Ivy Hall

country and the fashion of trolley tours inures largely to the revenues of the electric lines in all directions.

While it is not essential to the purpose of this article to describe in detail the many old highways and environments now brought within reach of the people, some allusion to them may be timely. All of the old roads which converge upon Philadelphia are rich in historic suggestion; over them the armies of the Revolutionary patriots and of British foemen have marched in the tragic game of war. Along their once dusty course the old Conestoga wagons once carried the freightage of a rich countryside and beside them yet stand embowered in ancient groves, the picturesque taverns where the hurrying stage coaches constantly stopped for change of horses and the refreshment of passengers. The Old York Road, Gray's Ferry Road and Darby Road were links in the one toilsome highway which joined the Puritan east and the Cavalier south together; Germantown Road bore the brunt of the fierce battle of that name and it was along the Ridge Pike and Norristown Road that the patriots retired to Valley Forge.

For many years in the early days of the Camden & Amboy Railroad, travel moved between the city and the Bordentown steamers out to the wharf at Tacony over the Bristol Road. Lancaster Pike was the first highway to the unknown west and Baltimore Pike, as its name indicates, the chosen route to the Monumental City.

DELIGHTFUL SUBURBAN RIDES

The cars of the Rapid Transit Company make connections with the cars of all other lines reaching out into the country from the four points of the compass. These connections are made over rides through some of the most picturesque country in this section. One of the most popular trolley rides is the connection made through Willow Grove and

Doylestown for Easton. Connections are made at Willow Grove Park for Doylestown, thence to Easton over a new line which is not as yet wholly completed, but it is a ride amid scenic beauty and is full of interest throughout; the road runs through a territory heretofore inaccessible by any means of transit. The cars of the Rapid Transit Company run on both Eighth and Thirteenth streets every few minutes for Willow Grove and the connections. The cars of this line also make connection at Doylestown for Newtown, Langhorne and Bristol.

Another popular trolley ride is to Allentown; this year this trip has been unusually attractive. It is enticing by reason of its varied scenery and the beautiful rolling country over which the cars travel. Connections are made for Allentown from the Chestnut Hill cars, which run out Eighth street; these cars all stop at the famous Old Wheel Pump Tavern. After leaving the Old Wheel Pump the cars go bowling along through the beautiful suburban country north along the Old Bethlehem pike, passing the ancient hotels which were once famous hostleries in the days of stage coaches. Along the road are many historic spots; near Fortside Inn is the old Revolutionary fort, the ruins of which are intact, and may be seen from the car. The spot is marked by a flag-staff. These cars, by rapid stages, pass through Rockhills, Perkasio and Quakertown, making connection for Richmantown, where, but a short distance beyond, a climb over the Lehigh Mountains begins.

Another beautiful connection made by the Rapid Transit cars is the ride to Norristown, Collegeville, Sanatoga, Pottstown and Reading. To make connections for this line take the cars on Eighth street, via Germantown avenue to Chestnut Hill, and connect with the suburban cars at city line; connections can be made at short intervals and the beautiful trip through superb country cannot be imagined. Along this road are many renowned and historic spots; the beautiful Perkiomen creek is crossed at Collegeville.

At the north of Collegeville, mid-way between there and Norristown, the cars stop for a short interval on an elevation near Eagleville. Tourists are enabled at this point to obtain a view embracing seven counties of this state, namely, Montgomery, Berks, Bucks, Chester, Philadelphia, Lehigh and Northampton.

Another beautiful ride leads to West Chester in Delaware county. Connections are made at Sixty-third and Market streets with the cars of the Philadelphia and West Chester Traction Company, upon which a most comfortable and exhilarating ride can be had from the thickly built up city to wide stretches of open country and pure air. The cars go straight through to West Chester and they traverse a beautiful and picturesque region. On this route is situated the Green Tree Inn, a famous stopping place for lunch. This line continues to Newton Square, on to Castle Rock Park at Crum's Creek, a favorable picknicking ground. Along this route are many streams which abound in good fishing. The Market street cars also make connections with Downingtown, Coatesville, via West Chester; also to Lenape. The latter ride is one of peculiar historic interest. Along this road marched the army of Cornwallis, the English general, prior to the battle of the Brandywine. Chester, Newcastle and Delaware City are reached by cars of the Darby Division running west on Walnut street; from Darby the line of the Diamond State follows the Plank Road, one of the oldest in the country, and which, almost its entire length, is dotted here and there with houses which are over a century old. The cars from Darby go direct to Wilmington and the route from Chester to Wilmington is almost constantly within sight of the Delaware river. Connections are also made at Darby to Swarthmore. A line has also been completed recently to Lansdowne, making connections at Darby with the cars of the Philadelphia Rapid Transit Company.

Another connection embracing a beautiful ride over famous country is the Angora line, which makes connection at Angora for Media and Glen-Riddle. The cars en route to Media, shortly after leaving Angora, pass Holy Cross Cemetery and Fernwood Cemetery, and thence by Lansdowne and East Lans-



Power House at Ogontz which Furnishes Power for Operating the Cars to and from Willow Grove, on Old York Road

downe, villages of pretty summer homes, a short run across the Darby creek brings the tourist to the thrifty manufacturing village of Clifton Heights. Another short ride brings the traveler to Burn Brae, the great sanitarium, and in succession follows Secane Highlands, with its famous boarding houses and Swarthmore College. Media is shortly reached and just beyond its border is the Pennsylvania Training

School for Feeble Minded Children, the grounds of which are open to the public. All of the cars running east on Market, Chestnut, Lombard and Vine streets make connections with the Delaware river ferries for suburban points in New Jersey, where roads have been recently built penetrating the prettiest towns in that state. From these ferries Trenton, Princeton, Woodbury and other well-known centres can be reached by easy stages and through pretty country.

Another ride which has become accessible through the lines of the Philadelphia Rapid Transit Company is that to Trenton and New York by change of cars at Frankford, Torresdale, Bristol and Morrisville. The ride to Trenton from Frankford is by easy stages, through a pretty country over hills and through vales, over which the cars run at points closely allied with the war of the Revolution. Besides these many connections the Rapid Transit Company has now under the course of construction a new road to Willow Grove Park, the pleasure ground renowned for its beauty throughout the country. This new ride is to be reached by the Seventeenth and Nineteenth street cars running north on Nineteenth street to Chew street, thence by private right-of-way to city line, where connections are also made by private right-of-way through Wyncote, Glenside and Hillside to the Old Welsh Road in the northern part of Montgomery county and by sloping hills and through dense woods the new road finally reaches its entrance to the park. This new road will be completed and in perfect operation when the season of 1905 at the park opens. This, then, will be the Rapid Transit Company's third direct route to the park, namely: Old York Road via Fourth and Eighth streets and Germantown avenue cars, the Thirteenth street cars and the Seventeenth and Nineteenth street cars over the new road. Visitors can be taken over the historic Old York Road and return by the new route and vice versa, and thus, for a very

moderate fare, can secure a ride to an unsurpassed pleasure grove over roads punctuated throughout the entire route with beautiful scenery and historic spots reaching back to the Revolutionary days.

BEAUTIFUL WILLOW GROVE PARK

Old York Pike, one of the best known of these outgoing roads, because it leads to Willow Grove, is practically a rural extension of Broad street, continuing in an irregular course directly northward. Between the city and Willow Grove it is bordered almost constantly by attractive villages and fine old private estates. At Ogontz is located the power house from which the cars upon this line receive their propulsion. These cars are operated northward upon Eighth and Thirteenth streets, the length of the ride from the centre of the city to Willow Grove being thirteen miles.

While yet two miles distant from Willow Grove, glimpses are enjoyed of the fairyland which has been created there. Our grandmothers and their grandmothers, too, went to Willow Grove with delight, for it is one of the oldest country retreats in the whole land. The stream at Willow Grove has always been called Round Meadow Run. All the land hereabout was bought by William Penn from the Chief Metamcont. It was acquired in 1684 by Nicholas More, a London physician, who became the first chief justice of the province. His heirs sold it to Nicholas Waln and Thomas Shute. In 1719 it was owned by James and Jacob Dubree. The medicinal value of the spring at Round Meadow was no doubt early understood, and a flourishing hotel was in operation here in 1732, called the "Red Lion." In 1768 it was advertised for sale, under the name of "The Sign of the Wagon," and this was the title which it probably bore during the Revolution. At this time it was kept by Joseph Butler. Washington, his officers and army were frequently to be found here, especially during the campaign of 1777. During the operations of General



The \$100,000 Electric Fountain at Willow Grove Park

Howe, from Philadelphia toward White Marsh Valley, in early December, 1777, Colonel Morgan's troops and the Maryland militia had a fight near Edge Hill, about three miles from Willow Grove, with the British column. The American loss was forty-five killed and wounded. The British lost four officers and thirty men. The Continental wounded were brought to the hotel at Willow Grove.

The place was given the name of "Willow Grove," it is said, by Reading Howell, who mapped the region in 1792. In 1811 it was referred to as Rex's tavern. This was the old Mineral Springs Hotel, built in 1803, and which became a fashionable resort for city families. As late as 1851 five daily stage lines changed horses here. Passengers from the city used to leave the "White Swan Inn" (already mentioned), or the "Green Tree," upon Fourth Street, at an early hour and breakfast with great appetites at Round Meadow, after their sixteen-mile ride. Overshadowing Willow Grove is the shapely hill, called "Horse Heaven." From the summit of this elevation one gains a noble view of the rounabout country. To the northeast is the valley of Southampton Run, where John Fitch first tried his model steamboat, upon the Pennypack Creek. Along Huntington Valley were the Swedes in early days; north of them were the Dutch; at Warwick the Irish; at Gwynedd the Welsh; over toward Germantown the Germans; the Scotch were settled at Horsham, while at Moreland and Abington were the English Quakers. The descendant generations of this varied and hardy group of people have certainly made this a land of plenty and beauty, well worthy of its modern jewel—the scenic summer park of Willow Grove. The waiting-room and car sheds of the Union Traction Company are located at the terminus of the line at Willow Grove. The park fills all of the valley to the left, and it would be difficult to find another location so happily formed for its present purpose.

Willow Grove Park has been aptly called "Phila-

delphia's Fairy Land." The scene at night along the graveled walks of the lakeside, with the electrical effects, the magnificent iridescent fountain, the music and gaiety, must surely bring to mind the splendors of a great exposition.

Willow Grove Park was established by the Rapid Transit Company a number of years ago in the belief that a resort which caters to the most refined elements of society would receive abundant recognition and support. Experience has demonstrated the wisdom of this theory. The leading people in Philadelphia and notably those who appreciate the best musical composers as interpreted by leading organizations are the constant habitués of this ideal place.

Willow Grove Park is the model emulated to some extent by the people of other cities to which its fame has spread.

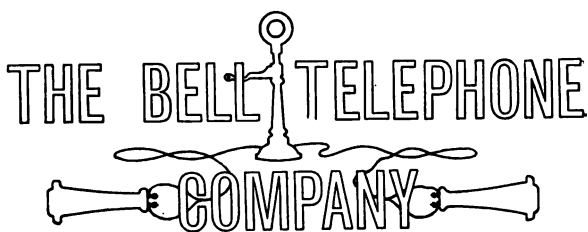
The electrical effects employed here are exceedingly artistic, the central feature being the spectacular and graceful fountain in the midst of a placid lake. This fountain cost \$1,000,000.

The facilities for transporting and handling large numbers of people, sometimes aggregating above 150,000 in a single day, are ample.

*THE BELL TELEPHONE
COMPANY*



Executive Offices of The Bell Telephone Company of Philadelphia
and The Delaware and Atlantic Telegraph and Telephone
Company. 17th and Filbert Streets, Philadelphia, Pa.



THE Bell Telephone Company of Philadelphia with its sub-licensee company, The Delaware & Atlantic Telegraph and Telephone Company, furnishes service to 71,000 telephones in the city of Philadelphia and the fourteen surrounding counties.

The original telephone patents were granted to Alexander Graham Bell, March 7, 1876, and the telephone was first publicly exhibited at Philadelphia, in the Centennial Exhibition, the same year. This remarkable invention was curiously examined—greatly talked about and strange prophecies ventured as to its eventual use, but the widest of them missed the mark and failed to foretell the many uses it has since been put to; its position in business life; the dependence placed upon it in the greatest transactions of the age; its almost incredible and fixed value in the home and its latest wonderful work in cheering the sick.

In this city millions were expended—the Company's offices were then on Chestnut street—in placing and improving the grounded circuit system, with its slow handling switchboard and its maze of overhead iron wires.

Twenty-two years ago there was practically no underground system in the world, though the city of Paris utilized its sewers for its wires; to-day in



An Old Type Switchboard



A Section of a Modern Multiple Switchboard, Locust Central Office, Philadelphia, Pa.

Philadelphia the former equipment has been relegated to the junk pile and the iron grounded lines are replaced by thousands of miles of copper wire, extending to nearly every portion of the city in an



The Main Station of an Operatorless Private Branch Exchange

elaborate system of underground conduits. These wires terminate in neat junction boxes in the rear of properties. The entire city is now furnished with modern metallic circuit connections.

Philadelphia has an area of 129 square miles; extreme width 8 miles and extreme length 20 miles,

and to properly serve such an immense territory, 16 separate local exchanges are in operation. These handle the stupendous traffic of nearly 200,000 originating messages per day.

Modern telephone service in Philadelphia has many special features—business and residence serv-



Substation Equipment of an Operatorless Private Branch Exchange

ice are old divisions; the private branch exchange is now in common use, it has a miniature switchboard with one or more operators for business houses, connecting all the offices and departments of the company and permitting each interior station to enjoy intercommunicating service within the building and local city and long distance con-

nections through the Company's exchange. A new switching apparatus has been lately devised to satisfactorily give private branch exchange service *without* an operator. The modern hotels have telephones in every guest's room and by means of private



Instrument for Special Restaurant Service

branch exchange system lend considerable convenience and enjoyment to their guests. Restaurants are equipped with apparatus within reach of every table and upon notice to the waiter, a telephone is brought and by means of plug and flexible cord, connections are made and business and social matters can be taken up far and near.

The Sunday services of the Grace Baptist Church

are regularly transmitted to 40 patients in the Samaritan Hospital and the telephone weekly does—and does well—its work of charity.

Thirty thousand farms are in close touch with the city's borders and the establishment of a farmer's



New Portable Desk Set

telephone system a few years ago was a seed sown from which has grown the general use of the telephone among our farmers.

The telephone system is probably the country's greatest unifier, bringing within a moment's call, far off Dakota, Nebraska, Texas, the Middle-West, North, South and Canada. The value of the instant return message gives it decided superiority over

other means of communication. The remarkable march of the telephone's improvement, since its birth at the Centennial Exhibition; the patents and equipment superseded in such a short period of time, seem to forecast the possibility of the present intricate multiple switchboard, and elaborate and delicate equipment giving way to even newer methods.

The cables carrying 60 pairs of wires once answered every need and were laid with the thought that provision was being made for the new business for many years. Probably no better example of the



New Standard Wall Instrument (bells inside)

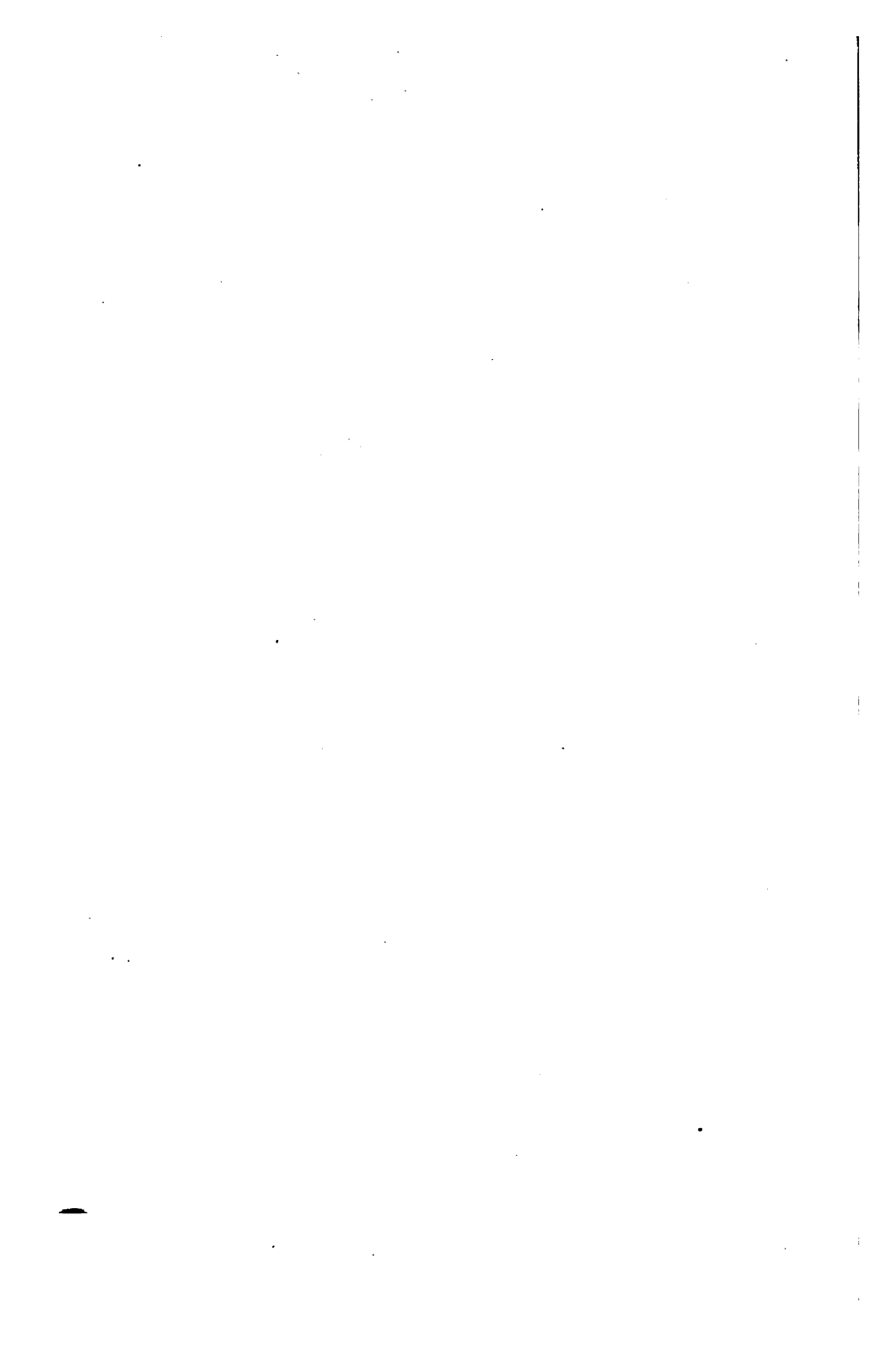
telephone's development is needed than to say that these cables have been replaced by those carrying 440 pairs of copper wire.

Philadelphia's problem will soon be that of serving 200,000 subscribers. The growth from 20 telephones to 71,000 means both a natural and forced development. Through these years, judicious advertising, thorough canvassing, reasonable rates and good service were the business methods used to educate the public to the use of something, which now everybody recognizes as an absolute necessity in the transaction of business and in the comfort of the home.

In Overbrook—a suburban residence section within the city limits—90 per cent. of the houses

have telephone service. Development is not so high in the other parts of the city but there is no doubt that the telephone will soon be considered a permanent fixture in every home as the gas, electricity and water now are. A large part of the development of telephone usage may be credited to the public pay stations conveniently located.

At one time, one exchange was sufficient to handle the daily traffic. This eventually grew to 16 as previously stated. One business office answered for payment of bills and handling general correspondence, but as the Company's business enlarged and the suburban districts became more thickly populated, district offices were established in some sections. At these offices subscribers pay their bills, enter their complaints and arrange for changes in their service and contract.



*THE KEYSTONE TELEPHONE
COMPANY*



Main Exchange Building

THE KEYSTONE TELEPHONE COMPANY

THE Keystone Telephone Company of Philadelphia was incorporated in April, 1900, and secured franchises during the same month authorizing it to operate as an independent or opposition company in this city and vicinity. The engineering work was commenced immediately and actual operations were under way within the year. The first exchange was opened for business on January 1, 1902. Six months later the Company had four exchanges in operation and had commenced giving a general service in Philadelphia and vicinity.

The exchanges at the present time are six in number. The original or main exchange is located at the corner of Second and Sansom streets in a spacious building remodelled for its present uses from the structure formerly and for many years in use as the Commercial Exchange. As the illustrations indicate it is especially well adapted to the actual and growing business of the Company. The other exchange buildings were all erected for the use of the Company and are models of convenience and economy in the handling of daily business.

These six exchanges are the central points for some 15,000 telephones, all installed within the past two years. In the central portion of the city from Fairmount avenue to Washington avenue all connections are made directly to the buildings. No poles, whatever, are used. In the outer districts

the cable connections are made through the conduit system to the pole in each block and distributed to the rear of the buildings. By this means all disfigurement of the streets by additions to the vast array of existing poles has been permanently avoided. The Company owns a general subway system and furnishes conduit space to several other cor-



Corridor at Main Exchange

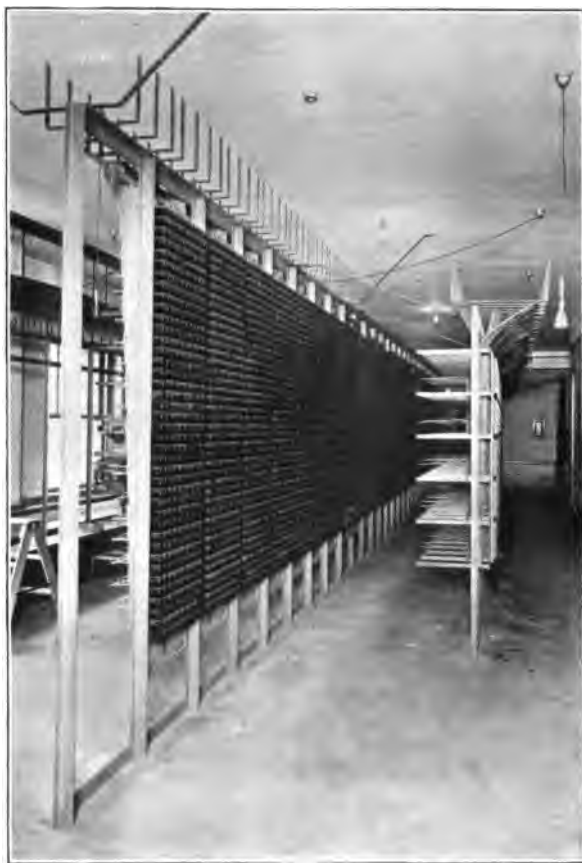
porations. The Company has constructed 10,500,000 feet of conduit made accessible by 5,200 man-holes.

Many branch exchanges, numbering at present 159, have been installed with large users of the service. These include public and corporate offices, department stores, clubs, hotels, banks and manufactories. This feature of the business is rapidly growing in importance.

The connections of the Keystone Telephone Company with lines outside of Philadelphia give it



Main Exchange, Second and Sansom Streets



Distributing Frame and Relays at Main Exchange

command of all points in Central and Eastern Pennsylvania, Central New Jersey including Atlantic City, and the States of Delaware and Maryland. The companies thus allied to the Keystone are: The Eastern Telephone & Telegraph Company, The United Telephone & Telegraph Company, The Keystone State Telephone & Telegraph Company, The Consolidated Telephone Company, The Standard Telephone & Telegraph Company, The Interstate Telephone Company, The Maryland Telephone & Telegraph Company, The Bradford County Telephone Company, The Tunkhannock & Wyoming



Battery Room, Main Exchange

Valley Telephone Company, The York Telephone Company, and the Camden & Atlantic Telephone Company.

Many of the points within a considerable radius of the city are reached by direct Keystone service, all such subscribers being listed in the Keystone book.

The telephone exchanges which have been a part of the electrical exhibits in the great expositions of recent years have invariably attracted the public and piqued popular curiosity. The general public still knows little, however, of the routine workings of these now indispensable centres of local communication. Even to specialists in the field the sev-

eral exchanges maintained by the Keystone Telephone Company in Philadelphia will present some features indicating a great advance in the work of serving the public. Not the least interesting of innovations are the apartments intended for rest and recreation of the patient and tactful young ladies who attend the imperative calls of our subscribers. These employees, when on duty, are also supplied



West Exchange, Filbert and Preston Streets

with meals at the main exchange without charge. This system will eventually be extended to the other exchanges.

The operators at the main exchange and elsewhere are given a half hour intermission morning and afternoon to lounge in the rest room to employ as they will. A large corps of substitutes provides relief for the relays of operators on intermission or at lunch. The average layman hazily pictures "Central," that place heard so long but never seen, as a modern Babel, delivered over to jarring voices, ringing bells and general pandemonium. If he should visit the



Operating Room, West Exchange

exchange pictured here he would see probably sixty girls at work at a switch-board handling 10,800 calls in a single busy hour. Yet there is no noise louder than the hum of a swarm of bees. The operators are too busy for the bustling confusion of incompetency; ingenious devices have brought the eye to the ear's relief, replacing bells by a system of lamp signals. Everything makes for efficiency. The girls sit almost rigidly motionless. During the busy hours an operator makes on the average from five to ten connections per minute with automatic accuracy.

The long L of the switchboard with its sixty operators proves, on nearer view, to be divided into twenty practically independent sections, some of which are assigned to direct subscribers, some to party lines and others to pay stations, while the rest are connected with branch stations throughout the city.

The wire that leads from the 'phone in a given office, after being carried along underground to a distributing board at "Central," has branched out to each of the twenty sections of the switchboard. By this means any subscriber whose "answering jack" is located upon one of the twenty sections may be connected with a 'phone leading to any of the other nineteen sections.

This multiple system is enormously expensive, but no other system has been devised that gives the accuracy and speed demanded and time is more than money. As one examines the board the flashing of tiny electric lights attracts attention. Perhaps you chance to see one of these lights signalling in your call section in the answering jack marked 11-44, notifying you—and the operator—that your partner in the office two miles away has taken his receiver from the hook. At the same time the illumination of a larger general signal called "the pilot" makes assurance doubly sure that the operator will not overlook the call.

The operator at once inserts an "answering



Distributing Frame, West Exchange

plug" in 11-44 and goes in on that wire with the mellifluous inquiry, "Number?" The use of the word "hello!" is vigorously barred to the "hello-girl." On getting your partner's request "Main 8-00" she first makes the "busy test." It is quite possible that "Main 8-00" is engaged on one of the other sixteen sections in which it appears. To ascertain this the operator taps with a calling plug on the jack or terminal of Main 8-00, which is connected in such a way that if Main 8-00 is busy there is a flow of current from the operator's receiver to the ground and a buzzing sound results. When the man behind the receiver at the other end hears this he may as well hang his receiver upon the 'phone instead of waiting for the confirming, "They're busy."

If the "coast is clear" the operator inserts her calling plug in Main 8-00—another tiny lamp flashes out its signal and sparkles until the person calling has taken down his receiver. In a minute or two the same little lamps flash out a signal that the subscribers have finished talking. If only one light appears the operator knows that the subscriber wishes to talk to another party and the process is repeated.

Many wonderfully ingenious devices have come into use intended to minimize the confusion which attended the earlier use of the telephone, due to both the public lack of training and the imperfection of the old exchanges and errors of the girls. For instance, on the chief operator's desk is seen a miniature switchboard connected with every position upon the main board. Every call entering the exchange is represented on this board by a white light in the corresponding section. If the light lasts longer than three seconds, showing that the call has not been taken up, the monitor at the chief operator's table knows that the girl concerned is not attending to business. When the subscribers cease talking a red light appears in the same way just below and again three seconds is the limit allowed to disconnect.



Rau Exchange, 16th and Summer Streets

It is from the inquiry desk that all information is imparted to forgetful subscribers who wish to know the name and address of Main 8-00 or any other subscriber whose number he has. From here also



East Exchange, Kensington Avenue, below Somerset Street

are answered the thousand and one irrelevant but anxious questions bearing upon every event far and near happening in the world's turmoil around, for the telephone girl is at the immediate focus of all current rumor and statement and presumably knows

just what everybody else is desirous of finding out ahead of newspaper proclamation.

One of the most recent achievements of the Keystone Telephone Company is the establishment of the Evening Telegraph Information Bureau, which means that any subscriber or any person using a pay 'phone may have, instantly, the very lat-



Park Exchange, Park Avenue, above Susquehanna Avenue

est information which has come to the editor's office upon any subject of current interest and for which he would otherwise be obliged to wait until the newspapers are issued. The importance of this innovation can hardly be over-estimated. It not only affords immediate news of often vital consequence to the inquirer, but is extended to the field heretofore occupied only by the "want" column and

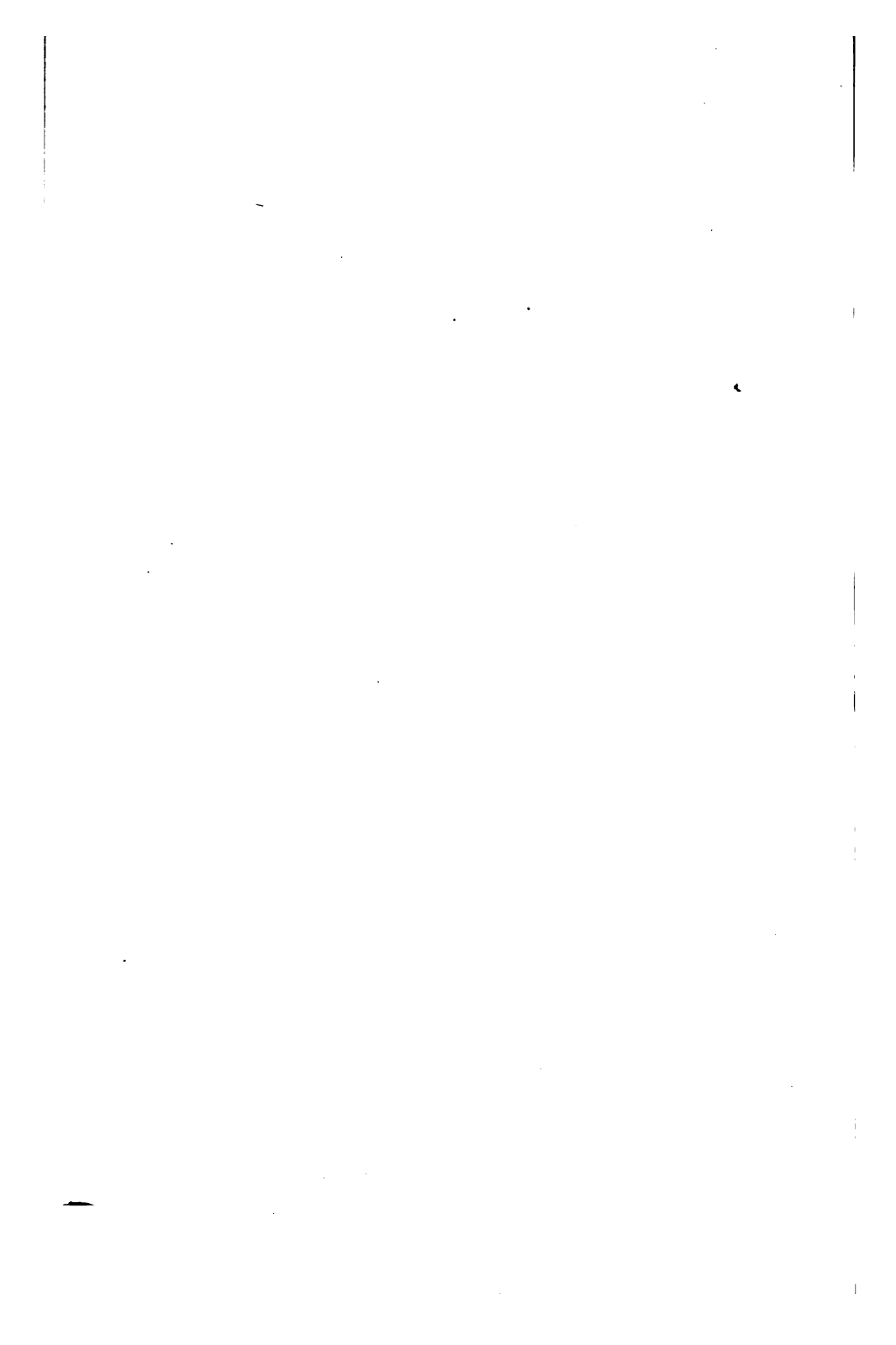
the "lost and found" list. In the former the man who has a job waiting for the worker and the worker who wants the job may come together without waiting to study the papers. In the latter case the finder of the lost wallet may 'phone his address at the



North Exchange, Collom Street, East of Germantown Avenue,
Germantown

same moment that the loser is notifying the Bureau and in a moment more they are in touch and thus a sleepless night is avoided. Experience in this interesting adaptation of telephone service suggests a wide variety of further uses, all tending to reduce distance and time and so serve the world.

*THE PENNSYLVANIA
RAILROAD*



THE PENNSYLVANIA RAILROAD

UPON a foundation, originating in the construction, during the latter years of the eighteenth century, of a system of State highroads, utilized during the early years of the nineteenth century by various private interests in the transportation of man and products by leasehold from the State, the Pennsylvania Railroad, under the guidance of a series of remarkably far-sighted executives, has developed into a system which is, in magnitude and efficiency, the model and envy of the transportation interests of the whole world.

Vast projects for the future improvement of its service, the broadening and deepening of its fields of influence and the increase of its earnings are now in hand. These involve the expenditure and permanent investment of sums of money far in excess of those ever expended for similar purposes within the same period by any one corporation in the history of traffic.

These improvements, including the erection of three magnificent new terminal stations and the practical rebuilding of the present fine station in Philadelphia, the elevation of tracks upon solid viaducts through the larger cities traversed by the lines, and the erection of superb stone bridges, notably the one across the Susquehanna River at Harrisburg, are in the hands of an engineering force imbued with the belief that all things are possible to human ingenuity in railroad construction. This force has already accomplished wonders, and has in prepara-



The New Stone Bridge over the Susquehanna River at Rockville, Pa.—Carrying the Main line of the Pennsylvania Railroad over the Susquehanna River, five miles west of Harrisburg, Pa. Total length, 3,830 feet; number of arches, 48; length of each arch, 70 feet, 20 feet rise. Width of bridge, 52 feet. (4 tracks); tons of stone required in construction, 200,000; time required in construction, 18 months; opened to traffic April 1, 1902.

tion work which will forever stand as a monument to their creative genius.

The question of internal land and water communication was a serious one even before the Revolution. The mysterious West was becoming less and less mysterious through frequent explorations. George Washington visited it as early as 1770 for the purpose of examining the land and streams with a view of establishing a permanent route of communication between the Atlantic seaboard and the great rivers of the middle west.

As early as 1791 a society existed in Pennsylvania which had for its object the exploration of the various water and land routes through the State. Through its efforts, in conjunction with similar bodies in other States, the Continental Congress authorized among its first acts the creation of a National pike, which with the various highways leading over the Allegheny mountains, afforded all the communication then possible with the Mississippi valley. The original cost of the National Highway was \$1,000,000, a sum then thought vastly in excess of what ought to be spent upon a public improvement of this character.

The Union Canal, the company for constructing which was incorporated in 1791, was completed in 1827. It connected the Schuylkill River with the Susquehanna River. The Philadelphia and Lancaster Turnpike was opened in 1807, and about the same time two other companies were also incorporated in the State to extend this road by various routes to Pittsburg, two of which were subsequently completed.

Freight and passengers were conveyed over these routes in Conestoga wagons with great white canvas tops and ponderous, slow-moving wheels. They were usually drawn by six stout horses, and could carry a heavy load. Later stage coaches, either drawn singly or in trains, were utilized. The prices asked for transportation were high, and passengers in the through coaches, as well as chance travelers over the roads, were heavily taxed by tolls en route.

It was upon this foundation that the Pennsylvania

Railroad grew and its history is synonymous with the history of transportation in the State, as nearly every railroad or transportation line projected within the borders of the Commonwealth has been amalgamated, either by purchase or lease, into the system as it stands to-day.

THE FIRST RAILROAD

In September, 1809, the first experimental railroad track built in this country was laid out by John Thomson, Esq., civil engineer, of Delaware county, this State. It was constructed under his direction by a Scotch millwright, Somerville by name, for Thomas Leiper, of Philadelphia. It was 60 yards in length, and graded an inch and a half to the yard. The gauge was four feet, and the sleepers were eight feet apart. The experiment with a loaded car was so successful that Leiper had the first practical railroad built in the United States constructed for the transportation of stone from his quarries on Crum creek to his landing on Ridley creek, Delaware county, a distance of about one mile; it continued in use for 19 years.

The success of this little line led to more ambitious efforts, and in 1827 there was completed a road at Mauch Chunk which was, with its branches and sidings, 18 miles long. It connected a coal mine at Summit Hill, where coal was first discovered in that section, with the Lehigh river, and was operated by inclined planes and gravity.

During the following year, in 1828, several railroads were commenced in this State. Among them was that of the Delaware and Hudson Canal Company, at Honesdale, to connect its mines with the canal, and on this road the first locomotive in America was run. It was named the "Stourbridge Lion," and was tried on the road on the 8th of August, 1829; but it was found to be too heavy for the roadway, was housed up, and finally taken to pieces and destroyed.

The Pennsylvania Legislature, on March 31, 1823, passed an act incorporating a company to construct a railroad from Philadelphia to Columbia, a distance of about eighty miles; but the project was never undertaken

under the authority thus obtained. The failure of this project was due probably to the fact that people at that time had little faith in the practicability of steam railroads, water communications by means of canals being the favorite theory of that period. In 1824, the Legislature authorized the appointment of three commissioners to explore a route from Philadelphia to Pittsburg for such an improvement. Their report appears to have been favorable to the construction of a combined slack-



Enlarging a Deep Cut for a Fourth Track

water and canal line, connected over the Allegheny Mountains by a road of some kind. In 1826 the Pennsylvania Canal was authorized by the Legislature, to be built at the expense of the State.

In 1827 the Legislature authorized the commissioners to make examinations for such a road through the counties of Chester and Lancaster to connect with the canal. They were also to extend their examinations, for the same purpose, from Wrightsville, York county, and from Harrisburg, through the Cumberland Valley, to Chambersburg. The following year (1828) these commission-

ers were directed to locate and put under contract a railroad from Philadelphia (via Lancaster) to Columbia, and complete the same within two years, if practicable. They were also, by the same act, required to examine a route for a railroad from Huntingdon to Johnstown; and the sum of \$2,000,000 was appropriated for these purposes. Work upon the canals already commenced was ordered to be continued.

ACTIVE CONSTRUCTION BEGUN

This was the actual commencement of the Columbia and the Portage Railroads—both now a part of the Pennsylvania system. It was, too, the era of activity in railroad construction, and while the State was pushing forward its main line, individuals formed themselves into companies and began work on various enterprises of this character. A number of companies were incorporated in 1831; and in 1832, among others, the construction of the Harrisburg and Portsmouth, the Strasburg, and the Philadelphia and Trenton Railroads, was authorized, two of which are now controlled by the Pennsylvania Railroad Company. In the same year portions of the Columbia (more familiarly known as the "Old State Road") line were completed, and cars commenced running upon it during the year. In the following year (1833) the canal commissioners were directed by law to complete the Columbia Road with a double track, and the Portage Road with a single track, and to finish the main line of canal. The work was promptly completed, and in 1834 the entire line between Philadelphia and Pittsburg was opened for general traffic—passenger as well as freight. The line as finished consisted of the Columbia Railroad, eighty-two miles in length; the eastern division of the canal, 172 miles long, extending from Columbia, on the Susquehanna River, to Hollidaysburg; the Portage Railroad, thirty-six miles in length, from Hollidaysburg to Johnstown, and the western division of the canal, 104 miles long, extending from Johnstown to Pittsburg, thus making the aggregate length of the system 394 miles. It never proved remunerative to the State, owing to the re-

handling of its traffic at the various connections of the rail and water routes. The cost of this system up to 1843 was as follows: Columbia Railroad, \$4,204,969.96; eastern division of canal, \$1,736,599.42; Juniata division of canal, \$3,521,412.21; Portage Railroad, \$1,828,461.38;



A Typical Suburban Station, North Philadelphia, Pa.

western division of canal, \$3,069,877.38; total, \$14,361,320.35.

The organization of the present great system—the Pennsylvania—was the result of rivalry. The Baltimore and Ohio Railroad, which was the first great railroad built in the United States (it was incorporated in Maryland February 28, 1827, and in Virginia on March 8, of the same year), had secured from the Legislature of

Pennsylvania in 1837 the passage of a law incorporating the Cumberland and Pennsylvania Railroad Company, some years later known as the Pittsburg and Connells-ville. It was the intention to construct a line through Pennsylvania from Cumberland to Pittsburg, and this project stirred Philadelphia from centre to circumference.

As a direct result of this agitation two great town meetings were held in this city, at one of which the following significant resolution was adopted: "Resolved, by the Select and Common Councils of Philadelphia, that the Legislature be respectfully and earnestly requested not to grant the right of way to the Baltimore and Ohio Railroad Company, and to pass a law for the incorporation of the Pennsylvania Central Railroad Company, on such just and liberal terms as will guard the interests of the Commonwealth in the main line of public works, and will afford sufficient inducement for the construction of the said road." The Legislature did grant the right of way, in spite of all the protests from this city, but a year and a half afterward, the Baltimore and Ohio Railroad Company having failed to take advantage of the act, Governor Shunk annulled it.

THE PENNSYLVANIA ORGANIZED

The outcome of a meeting held in 1845, in the Chinese Museum, in Philadelphia, was the organization of a railroad company, and on April 13, 1846, an act incorporating the Pennsylvania Railroad Company was passed by the Legislature. From the date of its incorporation to the day it was organized, the history of the company is a record of struggles and more or less strife.

The principal source of difficulty was a monetary one. While the citizens of Philadelphia had been quick to petition the Legislature to grant a charter to the new company, they were slow to lend it pecuniary aid. Efforts were fruitless for some time to get the capital stock subscribed for. Even city councils took six months to decide to aid the struggling corporation. Well-known men

made personal canvasses in the endeavor to get subscriptions.

On February 25, 1847, Governor Shunk issued the charter for the new company. At that time over 2,600 persons had subscribed to the capital stock. To-day



New Union Station at Pittsburg

there are over 45,000 stockholders, scattered all over the United States, England, and the Continent of Europe. Capitalized originally at \$75,000, to-day the outstanding capital stock is over \$296,000,000. Much of this stock is held in small blocks, which has been the case since the incorporation of the company, for the first annual report

states that out of some 2,600 subscriptions upon the books, nearly 1,800 were for five shares and under.

The Pennsylvania Railroad Company was organized March 30, 1847, at the Philadelphia Exchange, Third and Walnut streets. On July 16, 1847, the contract for the grading of the first twenty miles of the road west of Harrisburg was let, and on the 22d of the same month fifteen miles east of Pittsburg were also put under contract; on November 26, of the same year, forty miles additional were let on the Eastern division, carrying the road to Lewistown. About the same time a contract was made by the company for 15,000 tons of rails, to be manufactured in Pennsylvania.

The first division, extending from Harrisburg to Lewistown, a distance of about sixty-one miles, was opened to traffic, in connection with the canal and turnpike, on September 1, 1849. On September 17, 1850, the line was opened to the Mountain House, one mile east of Hollidaysburg, where connection was made with the Portage road over the Allegheny Mountains. In August, 1851, twenty-one miles of line west from Johnstown were finished, which, with the portion built east from Pittsburg, left a gap of but twenty-eight miles to complete the line. This was closed up during the following year, and, on December 10, 1852, cars were run through from Philadelphia to Pittsburg.

Connection between the Eastern and Western divisions was made by using the Portage Road over the mountains, the road of the company not being finished there until February 15, 1854, when it was formally opened and the first trains passed through Pennsylvania without using the inclined planes.

ADDITIONS MADE TO THE SYSTEM

From this date until the present time, the history of the company has been one of progression. With the completion of the main line between Philadelphia and Pittsburg, there came the necessity for extending the territory reached by the system. The Philadelphia and Erie Railroad, the Northern Central Railway and the Phila-

delphia, Wilmington and Baltimore Railroad, with their affiliated branches and divisions, were taken under the control of the company by leasehold.

In later years the Camden and Atlantic and West Jersey Railroad were taken into the company to form the West Jersey and Seashore Railroad Division. A number of small roads in Northern New Jersey were affiliated as an organization known as the United Railroads of New Jersey, which, with the building of what was known as the Connecting Railroad, gave the company an outlet to New York and the upper New Jersey seashore resorts.

More lately still, interests have been acquired in the Long Island Railroad, the Cumberland Valley Railroad, the Huntingdon and Broad Top Mountain Railroad, the Baltimore, Chesapeake and Atlantic Railway and steamship lines, the Allegheny Valley Railroad, and the Western New York and Pennsylvania Railroad, until to-day the system with its western lines all practically part of one great railroad, stands with 10,562.45 miles of tracks.

MARVELLOUS GROWTH SHOWN

When the first little train, drawn by a locomotive with bulging smokestacks, rolled across the mountains and down the western slope to Pittsburg, the employees of the Pennsylvania Railroad numbered but a few hundred. Its total pay roll in all departments was \$400,000 per annum, and its gross income \$2,000,000. In that year a single crude track traversed the State. The rails weighed 45 pounds to the yard and were made of iron. The entire rolling stock of the company consisted of 1,000 cars and fifty locomotives.

In the year 1901 the roster of the Pennsylvania Railroad carried the names of 106,000 employees, and the magnificent total of its pay roll was \$75,000,000. Its gross income was \$198,626,878, while its dividends exceeded \$10,000,000. Instead of a single track across the State, there are hundreds, piercing the country in all directions. Across these shining threads of heavy steel rails, most of them weighing 100 pounds to the yard, 4,296 locomotives, 3,088 passenger cars, 600 Pullman cars and

186,828 freight cars roll to and fro, in addition to hundreds of private stock, fruit, refrigerator and coal cars.

PHILADELPHIA THE CENTRE

Broad Street Station, the home of the Pennsylvania Railroad Company, and the principal depot in the city of



Broad Street Station, Philadelphia, Pa.

Philadelphia, was at the time of its erection one of the largest terminal stations in the United States, if not the largest. To-day it has become too small to amply provide for the enormous increase in the company's business, and it is proposed to practically reconstruct it in the near future.

Some facts and figures regarding the passenger and freight business handled by the Pennsylvania Railroad through its Philadelphia terminals show to what an extent this corporation has grown in but little over half a century.

During the first six months of 1903 the total number of pay passengers arriving and departing at Broad Street Station was 8,658,017, divided as follows: arriving, 4,306,180; departing, 4,351,837. During the same period in 1902, the number was 8,141,655: arriving, 4,041,120; departing, 4,100,535.

At the present time 265 trains run into Broad Street Station, and 273 run out of it every week day in the year. On Sundays, 155 trains run in and 157 out. All of these trains stop at the new West Philadelphia Station. In addition to these trains, there are 7 trains from New York to the South, and 4 trains from the South to New York, which stop at West Philadelphia, but do not run into Broad Street.

SEASHORE BUSINESS

To accommodate the business to seashore resorts and local towns in the State of New Jersey, there are 106 week-day and 41 Sunday trains outbound and 101 week-day and 42 Sunday trains outbound from the Camden Terminal of the New Jersey lines.

The traffic to seashore resorts has been marvellously increased within the past ten or fifteen years. Atlantic City, Cape May and other resorts have developed through the enormous business brought them by the railroads from small villages to cities with all the city conveniences and luxuries. Enormous hotels have been erected to accommodate the ever-increasing summer population, and all kinds of business enterprises have been fostered by the influx of visitors.

By far the greater majority of Atlantic City visitors may be classed as one-day or excursion business. The Pennsylvania Railroad has encouraged this class of business by providing first-class excursion trains, run on a fast schedule, for which tickets are sold at a low rate.

An instance of the popularity of this class of travel is shown in the movement by the Pennsylvania Railroad this summer of sixteen special excursion trains, 220 cars, bearing 12,778 persons to Atlantic City in one day on account of the Police Pension Fund of the city of Philadelphia. The first of these trains left Philadelphia at 6.30 a. m., and the sixteenth arrived in Atlantic City, 59 miles away, at 9.30 a. m., making an average speed of $46\frac{1}{2}$ miles an hour. The day previously, fourteen sections, 186 cars, carried 12,358 passengers, at an average speed of 44 miles an hour.

The figures of the Freight Department show just as surprising results. Reports for the year ending April 30, 1904, show that there was handled in the freight yards at Philadelphia 5,226,701 tons of inbound freight and 7,806,381 tons of outbound freight, a grand total of 13,033,082 tons for the year. This does not represent anything like the total tonnage for the entire system, as by far the greater part of the freight handled does not pass through Philadelphia.

RECENT IMPROVEMENTS

During the administration of Mr. Cassatt as president there has been accomplished the largest work in railroad improvements for the betterment of an existing line that has ever been attempted. Some idea of the stupendous railroading involved in these betterments may be gathered from the following figures, given in the annual report for 1903: During 1902 there was spent for revision of grades and alignment, abolition of grade crossings and new equipment for the lines east of Pittsburg \$25,874,276. Similar expenditures on branches in 1902, \$5,341,630. Estimated cost of improvements on lines east of Pittsburg, requiring from two to three years to complete, \$67,000,000. For the two tunnels and the terminal station to effect an entrance into and through New York city, \$50,000,000. Total cost of improvements accomplished and in contemplation, \$148,215,906.

It has been the constant aim of the company in providing for alterations in its trackage facilities to allow

for the greatest possible speed of its train movements, consistent with safety to passengers and to general traffic in the cities traversed by the line. Hence a large proportion of the amount expended for permanent improvements during the past two years has been devoted to elevating the tracks through large cities, the construction of heavy masonry bridges, the elimination so far as was possible of sharp and unnecessary curves and the completing of transfer tunnels and stations, doing away with needless double runs in and out of stations off the direct short lines between important terminals.

BETWEEN NEW YORK AND PHILADELPHIA

Of this work, the greater part has already been completed on the line between New York, Philadelphia and Washington. It will be but a short time until the entire line between New York city and Washington will be so arranged that the danger of grade crossings will be almost entirely done away with. This has been accomplished by the construction of a series of elaborate elevated structures and tunnels through the large cities.

The line has been elevated through the city of Newark, N. J., and its suburb, Harrison. The total length of trackage which has been placed on a solid masonry structure through these points is two and eight-tenths miles, and twenty-three street crossings at grade have been overcome. A new stone arch bridge, 1,455 feet in length, has been substituted for the old truss bridge at New Brunswick, N. J., and the grade of the line has been elevated for a total distance of five miles, carrying the line above the level of the city. At both Newark and New Brunswick the elevated structure is similar, heavy masonry being erected on either side of the four-track line, filled between with earth to the proper grade. In some cases, arches carry the line over the streets; in others the tracks are supported on plate girders.

At Trenton, N. J., an important change of route was made to eliminate unnecessary curves. About 10,000 feet of track was changed and the entire line elevated from a point about half a mile southwest of the Delaware River

to the new stone arch bridge crossing the Delaware River. In the city itself, the tracks are all below the city grade. The bridge, a stone-arch structure, is 1,220 feet in length and elevated 40 feet above mean low water. The bridge consists of 18 arches of masonry, each with a clear span of 60 feet. This work in and about Trenton cost about \$600,000.

At Bristol, Pa., the line is being elevated in a similar manner to the construction at New Brunswick and Newark. Numerous curves have been eliminated on the line between Trenton and West Philadelphia, where this line joins the western line of the company. Around Frankford Junction, where the Delaware River Bridge Route to Atlantic City branches off, alterations of grades and new construction work has been completed that aggregates in the total a cost of about one million and a quarter of dollars.

WEST PHILADELPHIA STATION

The construction of the West Philadelphia Station, with its intricate system of tunnels and elevated lines, involved an outlay of over a million of dollars, and was one of the most important works attempted in the scheme of permanent betterments.

The station itself, at which every train in and out of Broad Street Station, in addition to those which do not run into the terminal, stop, is a well-arranged structure, which with its appurtenances cost \$125,000. It is utilized as a transfer point for passengers from the various divisions of the system centering in Philadelphia to through trains west and south.

The arrangement of tracks covers two levels,—two grand divisions of the system passing above the grade of the station and city, and one below, through a system of tunnels. Through trains between New York and Washington are transferred from the upper to the lower level through a series of cuts and short tunnels. Three bridges have been constructed across the Schuylkill River to accommodate the traffic in and out of Broad Street Station.

Connecting the main line tracks with the Philadelphia, Wilmington & Baltimore Railroad tracks is a through freight line, carried on an elevated structure of steel and masonry from a point about half a mile above West Philadelphia station, over it, two main streets and two city bridges to a point about half a mile below the station.

Thus it will be seen that the company, to carry out its scheme of shortening time, has constructed an enormous freight and passenger yard system on four levels; the



Two Levels at West Philadelphia Station

through freight line, the main line and New York division, the yards for handling draughts and Pullman cars, and the tracks of the southern lines.

FIFTY-SECOND STREET STATION

At Fifty-second Street Station is another elaborate piece of yard work. After passing the point at which the New York division trains diverge from the main line through a series of cuts and tunnels, reaching to the connecting bridge across the Schuylkill River, the main line tracks rise on a gradual grade. Just beyond Belmont

avenue the outbound track rises at a grade of 1.5 per cent to Fifty-second Street Station, at which point the tracks are thirty feet above the grade of the street. The track is carried on a stone viaduct for a distance of 2,170 feet and then upon masonry and plate girder construction for a distance of 1,750 feet, then over a truss bridge, with a span of 385 feet, beyond which the outbound track of the Schuylkill Valley division curves to the northeastward, and the main line tracks gradually descend to the grade of the main line beyond.

The inbound track also rises from grade at Belmont avenue until at Fifty-second street the inbound and outbound tracks are separated by a vertical distance of 24.6 feet. Beyond the Fifty-second Street Station the two tracks diverge so as to make room for the great receiving freight yard located between them at that point. The inbound Schuylkill Valley track is depressed through a tunnel 325 feet long under the outbound and inbound main line tracks as well as the freight tracks connecting the receiving and classification yards. It switches around a sharp curve and joins the inbound main line tracks at a point to the east of Fifty-second street.

As has been stated, the New York division tracks diverge from the main line tracks at a point about midway between West Philadelphia Station and Fifty-second Street Station, through a series of cuts and tunnels. The company has constructed another tunnel leading from the New York division tracks to a point just east of where the main line tracks ascend to Fifty-second street, forming a Y. Through this tunnel run the through trains between New York and the west, which are not scheduled to stop at Philadelphia. A short line between the main line and the New York division, of older construction, is also afforded from Glen Loch by the Trenton cut-off, extending to Morrisville, just across the Delaware River from Trenton.

ALONG THE MAIN LINE

Among the important changes between Philadelphia and Pittsburg may be mentioned the elimination of 302

degrees of curvature in the distance of five and one-half miles between Glen Loch and Woodbine, where the present line crosses the original line no less than sixteen times, and the fact that only one and one-half miles of the original line remains in use. The aggregate curvature between the two cities, a distance of 105 miles, has been reduced 4,150 degrees.

The company is now working on a new low grade freight line, to leave the main line at Marysville, just west of Harrisburg, to Atglen, a distance of 72 miles. No curves exceeding two degrees will be used on this line and the maximum grade against eastbound business will be three-tenths of one per cent.

West of Harrisburg, improvements of a large character have been completed and others are under way. Of these, the Rockville bridge is one of the most important. This bridge replaces the structure which for many years accommodated all the traffic west and east.

The new bridge, carrying four tracks, is 3,830 feet in length. It is a solid masonry structure of forty-eight arches, 52 feet wide, and required in its construction two hundred thousand tons of stone. The approaches at either end are curved, the route lying at the base of mountains on either side of the river.

ACROSS THE ALLEGHENIES

The company has overcome great physical difficulties in crossing the Allegheny Mountains by several feats of engineering. Notable among these was the construction years ago of the great Horseshoe curve and the tunnels at Spruce Creek and Gallitzin. Two additional tunnels have been cut at the latter point, making three in all. Within the past two years a new low grade short line extending part of the way over the old Portage road has been constructed, cutting out many dangerous grades and eliminating the use of the Horseshoe curve for freight trains entirely. The old line between Hollidaysburg and Petersburg is being double-tracked. When this new cut-off is completed, it will have cost in the neighborhood of five millions of dollars.

To overcome yard difficulties in Pittsburg, the company is constructing a new cut-off line from Brilliant, a point on the Allegheny River northwest of Pittsburg, to East Liberty on the main line. Work is being prosecuted with great rapidity on four-tracking the entire line from New York to Pittsburg. Enormous cuttings are being made through the mountains and foothills to accommodate the extra tracks.

The improvements in and around Pittsburg have been many and of great importance. A magnificent modern union station has been erected, at a cost of \$2,185,526, and the entire yard has been remodeled and regraded so as to eliminate many grade crossings. The entire amount ex-



New York Terminal Station, Seventh Avenue Front

pended in these improvements for the past years aggregates over \$5,000,000.

THE NEW YORK TERMINAL

The proposed terminal in New York city, with the great system of tunnels under the Hudson and East Rivers, connecting the New Jersey and Long Island lines, is one of the most stupendous pieces of railroad construction ever attempted. The project, which is now well under way, has been maturing for three years, application for a charter to perform the work having been made to the New York city authorities in 1901. A certificate of approval of the plans was prepared and ap-

proved by the Board of Aldermen, December 16, and by the Mayor of New York, December 23, 1902.

A GREAT TUNNEL SYSTEM

Active work on the improvement was begun at once. A board of consulting engineers, composed of the highest authorities on engineering, was constituted, to whom was delegated the oversight of the work. Plans for the tunnel systems and the terminal stations had been in preparation for months.

The general plan of the improvement provides for a tunnel from the west side of the New Jersey bluffs opposite New York city, under the North River, Manhattan Island, and the East River to a point of connection with the Long Island Railroad tracks to the east of the city of Brooklyn, and a magnificent terminal station, occupying several blocks in the heart of the shopping and theatre district of New York city. The total length of the tunnel sections will be 5.7 miles.

The North River tunnel, upon which work is now being prosecuted rapidly, will be 14,351 feet in length. Beginning at the terminal on Ninth avenue, in New York city, the structure for 605 feet west is designed for four tracks in a single tube, the roof of which will be supported by steel trusses. The succeeding 1,096 feet are triple parallel tunnels, the middle tunnel carrying the tracks on which trains will be run to the point of connection with the New Jersey lines, the other two tunnels acting as yard tracks only. The middle tunnel branches into twin single track tunnels which extend across the river, and of which 5,947 feet are subaqueous tunnel. This will be a tube tunnel of the most modern pattern. From the terminal station to a point just beyond the middle of the river the tunnels will be constructed on a down grade. Beyond this point, an up grade of 1.30 per cent. will carry the tracks to the level of the New Jersey lines. From the end of the twin-tube tunnel on the New Jersey shore to the North Bergen outlet there will be 5,910 feet of full centre arch, twin, single-track tunnels. On the New Jersey side will be a shaft for ventilation.

It is impossible in the space at command to describe this work in detail.

Plans for the East River tunnel have not as yet been prepared in such detail as will admit of description. They will be similar in character to the North or Hudson River tunnels.

THE STATION IN NEW YORK CITY

Work upon the great Terminal station in New York is being rushed as fast as the contractors can accomplish it. When completed this station will be a model of its kind and one of the most completely equipped terminals in the metropolis.

The plans provide for a structure extending 430 feet on Seventh and Eighth avenues, from Thirty-first street to Thirty-third street. The frontage on the side streets will be 780 feet. The main entrance will be on Seventh avenue at the intersection of Thirty-second street. From this entrance an arcade lined on either side with shops will lead to the main waiting room and the station proper, which will be twenty feet below the grade of the street. Covered driveways will also lead by an easy gradient from entrances at the Thirty-first street and the Thirty-third street corners.

The general waiting room, around which will be grouped the ticket offices, baggage rooms and smaller waiting and retiring rooms for men and women, will be directly in the centre of the structure. It will be 320 feet long, 110 feet wide and 150 feet high. Back of it a broad concourse will lead to the Eighth avenue side, from Thirty-first to Thirty-third streets. From this, broad stairways will lead to the tracks, twenty feet below, or at a level of forty feet below the grade of the streets. Every facility will be afforded passengers in reaching proper trains, and the waiting rooms will be comfortably fitted up.

It is proposed to run passage ways from the waiting rooms to the city subways on which will be run the underground cars, and to provide for stations on the underground railways at these points.



New Union Station, Washington, D. C.

A NEW STATION IN WASHINGTON

The construction of a costly and ornate union station in the city of Washington has already been started. This work will be the joint operation of the several railroads entering the Capital, with a special grant from Congress. It is expected that about \$4,000,000 will be expended on the station building itself, and in the neighborhood of \$10,000,000 more upon the approaches. It will be constructed of white marble and will add greatly to the already improved architectural appearance of Washington. Thirty-six tracks will be afforded room in the train shed, in which will be housed trains from systems covering an aggregate of over 40,000 miles of territory. It will undoubtedly be, when completed, the finest railroad terminal in the world.

*THE PHILADELPHIA AND
READING RAILWAY*





THE PHILADELPHIA & READING RAILWAY

AMONG the varied factors which have contributed to the development of Philadelphia into a great, busy, prosperous and ever-broadening city, coal has been chief.

The Philadelphia & Reading Railway, its numerous branches interknit everywhere through the Pennsylvania anthracite coal fields, and having its chief tide-water terminal in this city, has been a pioneer and important agency in transforming the old market town of the agricultural counties into a domain of Vulcan and a leading distributing point for coal by water to all ports upon the Atlantic seaboard.

The Reading Railroad Company was the first to build a rail line in America for the primary object of bringing coal to the coast. Originally extending to the city of Reading, a distance of fifty-nine miles, it was soon pushed through to Pottsville, the first locomotive and train to traverse the entire ninety-four miles being run over the rails upon January 1, 1842. A contemporary writer chronicles the event by stating that a military parade, a train of seventy-five passenger cars containing 2,150 persons, three bands of music, banners, etc., were all drawn by one engine. The history of this great artery of freightage and travel has been one of aggressive progress. Its present relations to the prosperity of not only Philadelphia, but of a great number of cities and villages along its lines, are both intimate and vital.

No railway in the world is more favorably situated than the "Reading," which carries coal upon a down grade over its entire length.

The present corporation is known as the Philadelphia & Reading Railway Company. This company long since extended its lines to New York city and harbor, to the leading seashore resorts and to connections with other important systems which has placed it among the great passenger carriers of the country.

Throughout their entire length the Reading lines in the State of Pennsylvania lead among scenes pastorally beautiful or ruggedly grand. The valleys of the Schuylkill, Lehigh, Lebanon, Susquehanna and Cumberland are all famed in the annals of our early history and rich in picturesque details.

The locomotives of the Reading system are fed with clean anthracite coal and are consequently smokeless, much to the comfort of passengers and residents along the routes.

Philadelphia, dependent largely upon anthracite coal, was, until in very recent years, a smokeless city, a fact noted by every observant traveler.

The Philadelphia & Reading Railway Company controls a very large proportion of the almost exhaustless anthracite fields and existing mines. In the marketing of its enormous products it operates great fleets of barges and steamships engaged in both coastwise and transatlantic traffic.

The Philadelphia & Reading Railway Terminal Building in Philadelphia is located in the heart of the business section, at Market and Twelfth Streets. The main structure is one of the most notable architectural ornaments of the city and a distinct departure in exterior design from the usual type of railway station. The general offices of the company are located here and the facilities for the comfort and handling of large numbers of local and through passengers are notably excellent. The great train shed extends northward to Arch Street, the tracks being upon a level with the second floor. Main line trains traverse the city by an elevated track which

drops to a costly subway under and west of Broad Street leading as far as the Schuylkill River.

The New York and local trains run upon city grade through the uptown sections. This will, in time, be changed to an elevated or subway system. It has always been the policy of this company to encourage suburban improvement. In the Germantown, Chestnut Hill, Wis-sahickon and Frankford districts, as well as far beyond the city limits, large propulations have built beautiful neighborhoods, now within reach of the city proper by a brief and inexpensive trip by the Reading trains. Elkins, Glenside and many other charming suburbs are upon this line. Hourly express trains are run to and from New York by this line over the "Bound Brook" route, which was first opened to travel in 1876.

Through cars leave the Reading Terminal Station for Bethlehem, Pa., over the North Penn Railroad, long a portion of the "Reading" system. This line traverses one of the most beautiful and prosperous pastoral districts in America.

These cars connect at Bethlehem with the main line trains of the Lehigh Valley Railroad which have their terminals at Buffalo and Niagara Falls. The scenery along the Lehigh and Susquehanna rivers in the State of Pennsylvania is famed for wild grandeur.

It should be noted that the place where "stone" or anthracite coal was first discovered in this country was near Mauch Chunk, upon this line, and at Wilkesbarre, also upon the Lehigh Valley line, it was first successfully burned. For an inspection of the mines in the anthracite belt the Pottsville region offers the best facilities.

The seashore stations of the Philadelphia & Reading Railway are located at the foot of Chestnut Street and South Street. Express service is maintained throughout the year with Atlantic City, Ocean City, Cape May and many other leading places upon the New Jersey coast.

The present vast and complex system popularly known as the "Reading" extends its tentacles to many points in the interior of the State. Its great freight and passenger business has grown out of the small and experimental

beginnings of the old Philadelphia, Germantown & Norristown Railroad Company, for which Matthias W. Baldwin built his first locomotive in the year 1832. This engine, the "Ironsides," was first operated upon November 23d of that year. It was a four-wheeled engine, somewhat of the English Planet class. After it had been placed in service it hauled three trains each way

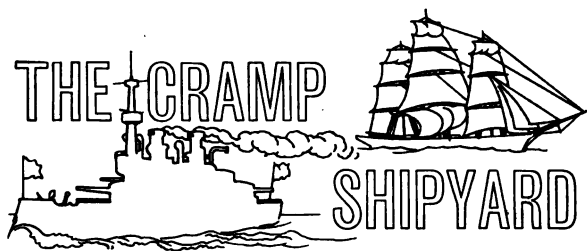


The Ironsides
First Baldwin Locomotive

daily, a distance of six miles, between Ninth and Green Streets, Philadelphia and Germantown, now a part of the city. Upon rainy days, however, the horses formerly used were again brought into service. Upon the trial trip the Ironsides attained a speed of twenty-eight miles per hour. This novelty thus identifies the Philadelphia & Reading Railway with the beginning of the greatest industry which this city has ever known and with an early page in the history of rail traffic in America.

THE CRAMP SHIPYARD





IN the year 1830 a young Philadelphia mechanic, William Cramp, ventured upon a ship-building industry and located his modest establishment at the foot of the highway now called Susquehanna Avenue, fronting upon the Delaware River. Here, and at the foot of Palmer Street, he built ships for a period of forty-two years, good, staunch craft which carried the flag of America into every port of the world. Here he saw the gradual evolution of the business through which the old oaken-sides were displaced with hulls of iron and steel, and sail hamper gave way to the more massive but less beautiful funnels and pipes of the steam-ship.

In 1872 the William Cramp & Sons Ship and Engine Company was incorporated and facilities for the work greatly increased. The history of this establishment since that year has been one of constant enlargement and activity. The people of the city and visitors from abroad have long regarded a visit to this immense ship-yard as a leading attraction in Philadelphia.

There are, at all times, numbers of huge ships, both of commerce and war, either upon the ways in various stages of completion or moored to the wharves awaiting the final work and equipment previous to their delivery to their prospective owners.

The founder of the business died in 1879, having thus rounded out nearly half a century of achievement in

maritime construction, during which he built 207 ships. From that date Charles H. Cramp, his eldest son, became the head of the company.

It is a notable fact that of the dozen or more ship-yards in existence along the Delaware river front when young William Cramp began business, but two, in addition to that founded by him, still exist. His success was undoubtedly due to his early recognition of the fact that the day of wooden ships was passing away and his prompt mastery of the problems attendant upon what was almost entirely a new line of business.



The U. S. Armored Cruiser New York

Hundreds of ships of all kinds have been committed to the waters from this vast yard, ships for commerce, pleasure and war, but the fame of the Cramps will always rest chiefly upon their magnificent cruisers and battleships. Many of the finest and most notable of our present naval craft were created here, types of national ships which have done more to enforce respect for our country in foreign ports and admiration for our skill than any other cause. With such ships as these the battles of Santiago and Manila Bay were fought.

Within recent years several ships of war have been built here for Russia, Japan, Turkey and other powers. In case of warfare in which this nation might hereafter be involved, the existence of this splendid plant, fully



The Imperial Russian Battleship Retvizan



The U. S. Battleship Indiana

equipped to strengthen our navy and effect speedy repairs, is a matter of the first importance to our interests.

Among the notable ocean steamers which came from the Cramp yards are the Pennsylvania, Ohio, Indiana and Illinois, four vessels which were the equal of any in their time. Later came the St. Louis and St. Paul, each of 10,700 tons, palaces of the sea, which, assumed temporarily by the Government, bore an honorable part as auxiliary cruisers in our war with Spain.

The private yachts Atalanta, Corsair, Stranger, Peerless and Columbia were built here, all prior to 1894.



A Launch at Cramps'—U. S. Battleship Maine

Many of the old ships turned out for the Government during the Civil War were furnished by the Cramps, including the New Ironsides, the wooden cruiser Chattanooga, the gunboat Wyalusing and the monitors Yazoo and Terror, besides a number of transports. Cramps are represented in our modern navy by the Baltimore, Philadelphia, Newark, New York, Columbia, Minneapolis and Brooklyn, all cruisers, and the battleships Massachusetts, Indiana, Iowa, Alabama and Maine. They are now building the armored cruisers Colorado, Pennsylvania and Tennessee, and the battleships Idaho and Mississippi.

The total number of vessels built at "Cramps" since the founder began business, dating to 1902, was 321. Of these, 25 are United States war ships, 1 Japanese war